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AMERICAN
DYESTUFF REPORTER
DEVOTED TO TEXTILE WET-PROCESSING

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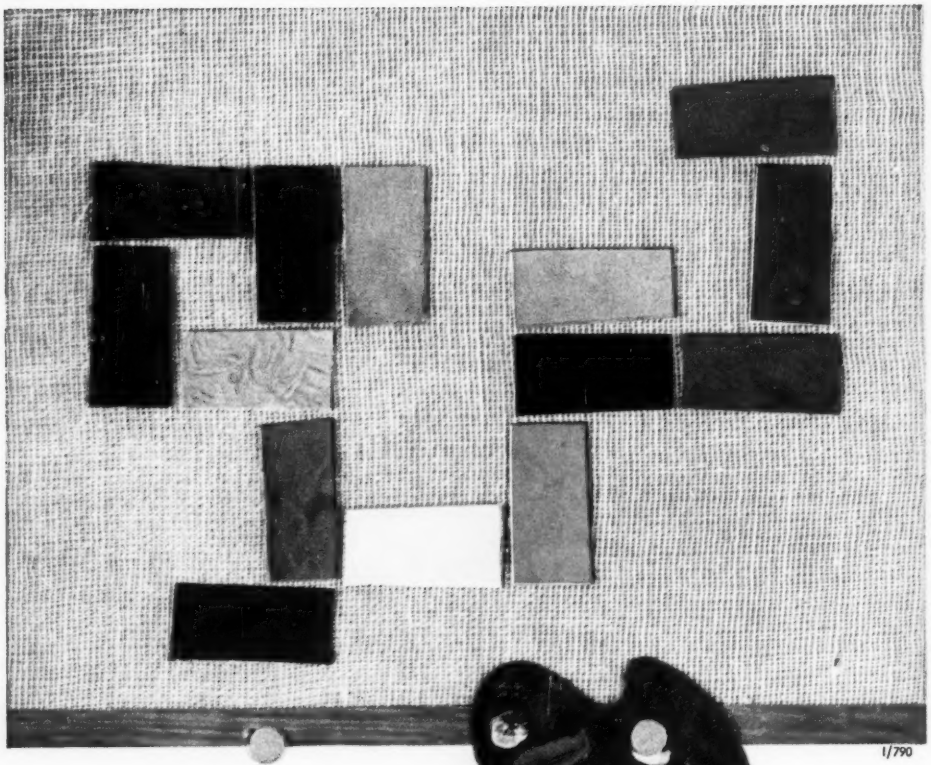

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AMERICAN

DYESTUFF REPORTER

Volume 49 November 14, 1960 Number 23

FA COTTON FABRIC: PRELIMINARY COST STUDY

O J McMILLAN JR, K M DECOSSAS, A S COOPER JR,
C HAMALAINEN, A L MURPHY and E F POLLARD

Southern Regional Research Laboratory[1]
New Orleans, Louisiana

FA cotton, a chemically modified cotton in which acetyl-groups are introduced into the cellulose molecule, has excellent electrical insulating properties, rot resistance, heat resistance, and flat abrasion resistance.

This product may be prepared from cotton in raw stock, yarn, and fabric form. In this cost study we have considered cotton in only fabric form having a degree of substitution of 2.0, that is, an average of two of the three hydroxyl-groups per anhydroglucose unit has been replaced by acetyl-groups.

Details of the process and hypothetical plants are described for producing this fabric product in 500 yard batches using conventional textile-processing equipment.

Investment costs, operating costs, and general expenses are given for plants with annual capacities of from 125 thousand linear yards up to 2.1 million linear yards.

It was determined in this cost study that at the present stage of process development, a fabric product, having a DS of 2.0, can be produced at a cost of 55.5¢ down to 28.3¢ per linear yard, or $1.30 down to 66.3¢ per pound of product. Captive supply or contract purchasing of chemicals and future process improvements could probably reduce these costs by as much as one-third.

[1]One of the laboratories of the Southern Utilization Research and Development Division, Agricultural Research Service, U S Department of Agriculture.

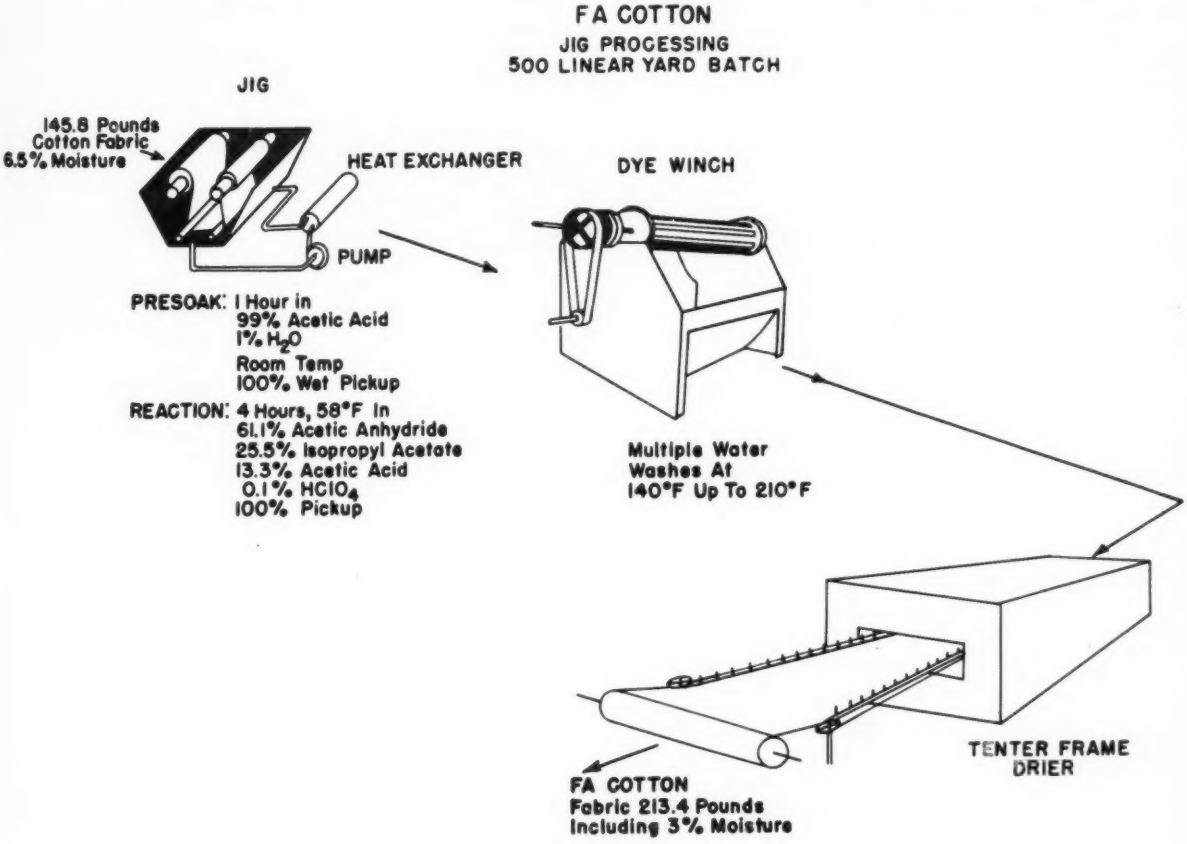


Figure 1

INTRODUCTION

OF the many chemically modified cottons under study (*4*), one of particular interest is highly acetylated cotton. This modification imparts excellent electrical insulating properties, rot resistance, heat resistance, and flat abrasion resistance to cotton. The product, usually referred to as FA cotton, may be prepared from cotton in rawstock, yarn, or fabric form by a substitution of acetyl-groups for hydroxyl-groups in the cellulose chain (*2, 6*). In this study we have considered cotton, only in fabric form, having a degree of substitution of two (DS = 2), that is, an average of two of the three hydroxyl-groups in each anhydroglucose unit have been replaced by acetyl-groups. Substituted cottons have been prepared with a DS up to three (*2*).

These products are unique in that the fibrous form of cotton cellulose is maintained along with its many inherently useful properties. In addition, certain new properties, such as good heat and electrical resistance and some thermoplasticity, are introduced (*2*). A similar product prepared by a different method has been marketed in Europe (*2*).

This paper is presented to reflect the cost of processing FA cotton at the present state of process development and not as a final cost study. Future process improvements should reflect lower costs for producing this chemical cotton product.

The batch process at its present state of development is diagrammed in Figure 1. Finishing equipment in the hypothetical plants studied includes from one to four enclosed dye jigs with squeeze rolls and heat exchangers, a dye winch for washing, a beater opener, an enclosed tenter, storage tanks, pumps, refrigeration equipment and a steam boiler. It is assumed in this study that a 500-linear-yard batch of 64 × 60 cotton sheeting, 60 inches wide, is processed per jig per eight-hour shift. This is based on experimental data obtained during pilot-plant processing of 100-yard batches of fabric on standard textile-finishing equipment, and smaller scale processing on laboratory-type equipment at the Southern Regional Research Laboratory.

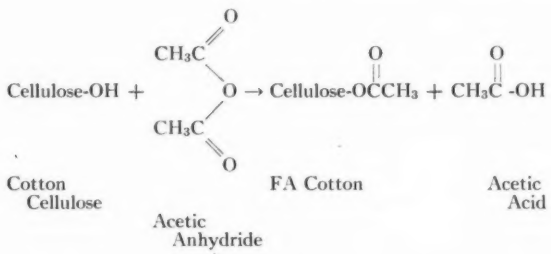
The fabric is presoaked in the jig for one hour in a 99% acetic acid-1% water solution at room temperature. This is followed by a four-hour reaction, also in the jig, in a solution containing acetic anhydride, isopropyl acetate, and acetic acid at 58°F. The isopropyl acetate serves as a diluent. Perchloric acid is used to catalyze the reaction (*1, 3, 5*).

TABLE
FA cotton fabr
(DS = 2.0

							processing c
Annual plant capacity (1000 yds)	125	250	375	525	250		750
(Thousands of pounds product)	53.4	106.7	160.1	224.1	106.7		320.1
Annual operation (days)	250	250	250	350	250		250
Daily operation (hours)	8	16	24	24	8		24
Number of jigs	1	1	1	1	2		2
Total plant cost ($)							275,697
Total annual processing cost ($)	143,823	164,320	181,104	181,104	221,007	253,2	148,947
Direct cost	33,561	62,245	90,718	134,967	55,275	102,4	101,700
Chemicals	16,950	33,900	50,850	71,190	33,900	67,8	25,918
Labor	8,043	16,878	25,715	46,287	8,143	17,0	7,641
Utilities	1,975	3,165	4,291	5,571	3,523	5,6	13,688
Other	6,593	8,302	9,862	11,919	9,709	11,9	20,717
Indirect costs ($) Payroll overhead, general plant overhead, control lab and packaging cost	6,885	13,039	19,163	30,719	7,817	14,2	
Fixed cost ($) Insurance, taxes and depreciation	12,327	14,296	15,921	15,921	18,944	22,8	24,201
Contingencies ($)	2,639	4,479	6,292	9,080	4,102	6,9	9,693
General expenses ($) General administrative and office overhead, financing and sales costs	13,993	19,389	24,513	30,958	21,651	30,6	37,692
Total processing cost ($)	69,405	113,448	156,607	221,645	107,789	175,8	241,250
¢/linear yd of untreated fabric[1]	55.5	45.4	41.8	42.2	43.1		32.2
¢/pound of product	130.0	106.4	97.9	98.9	101.0		75.4

[1] Fabric shrinkage is estimated at 8% in length, with no loss in width.

A simplified equation of the reaction follows:



The considerable heat evolved in this reaction is removed by rapid circulation of the reaction solution thru a suitable heat exchanger during the reaction period. After the reaction is completed the perchloric acid catalyst is inactivated by addition of, and reaction with, potassium acetate. The fabric is then given an initial water wash in the jig, squeezed to 100% wet pick up, and transferred to the winch for final washing. Opening and tenter drying of fabric completes the process.

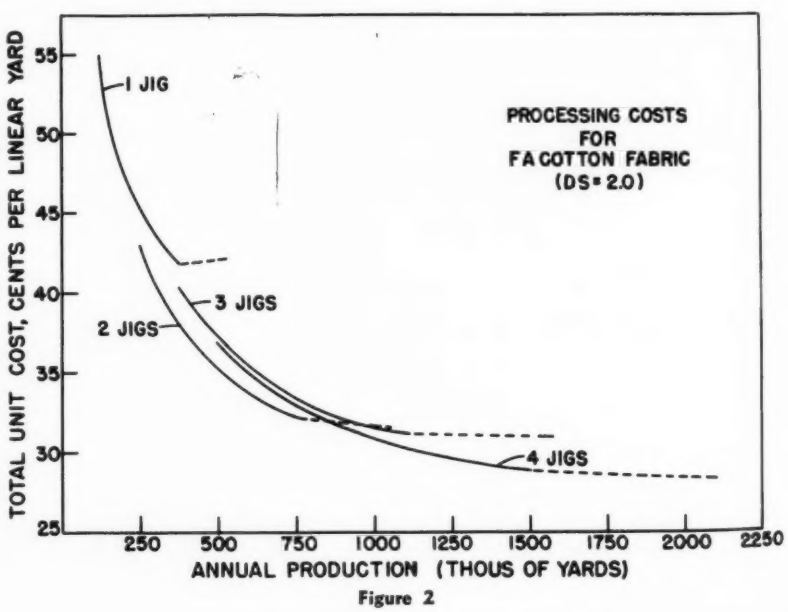


Figure 2

processing cost

750	375	750	1125	1575	500	1000	1500	2100
320.1	160.1	320.1	480.2	672.2	213.4	426.8	640.2	896.3
250	250	250	250	350	250	250	250	350
24	8	16	24	24	8	16	24	24
2	3	3	3	3	4	4	4	4
275,697	281,550	319,458	357,438	357,438	337,239	386,489	432,020	432,020
148,947	81,388	152,094	223,350	324,265	101,925	191,427	280,837	403,493
101,700	50,850	101,700	152,550	213,570	67,800	135,600	203,400	284,760
25,918	12,945	26,850	41,360	74,448	13,045	27,355	41,663	74,993
7,641	4,910	8,001	10,917	14,415	6,229	10,210	14,219	18,852
13,688	12,683	15,543	18,523	21,832	14,878	18,292	21,555	24,888
20,717	10,673	19,634	28,864	46,438	11,416	20,869	30,287	48,222
24,201	24,229	27,872	31,520	31,520	29,101	33,836	38,211	38,211
9,693	5,815	9,980	14,187	20,111	7,123	12,308	17,467	24,496
37,692	28,958	40,749	52,661	66,418	35,075	49,890	64,470	80,836
241,250	151,063	250,329	350,582	488,752	184,667	308,360	431,272	595,258
32.2	40.3	33.4	31.2	31.0	36.9	30.8	28.8	28.3
75.4	94.4	78.3	73.1	72.6	86.0	72.2	67.5	66.3

Annual productions were varied for the plants having one to four jigs by varying operation for one, two, and three shifts 250 days per year, and for three shifts for 350 days per year. Annual productions were thus varied from 125,000 linear yards for a one-jig plant operating one shift for 250 days per year, up to 2.1 million linear yards for a four-jig plant operating three shifts for 350 days per year.

COSTS

PLANT COSTS——Total plant costs as tabulated in Table I, were determined using new equipment, buildings, and auxiliary facilities. Tenter frame costs were allocated on a time-used basis. It was assumed that tenter drying would be accomplished in adjoining or nearby facilities, since annual productions did not justify the purchase of this piece of equipment.

PROCESSING COSTS——The processing costs are exclusive of the cost of cotton fabric used, and are for custom processing without profit. They are tabulated in Table I and graphically expressed in Figures 2 and 3. Chemical recovery of 90% from initial water washings and from used presoak and reaction solutions is assumed at a cost of one cent per pound of recovered chemicals. Chemical costs reported in this paper are based on current market prices, and subject to revison according to the prices at which a particular textile processor could obtain them.

Market prices used were as follows:

Acetic acid	10¢/pound
Acetic anhydride	14¢/pound
Isopropyl acetate	11.5¢/pound
Perchloric acid (70%)	63.5¢/pound
Potassium acetate	28¢/pound

Table II presents an allocation of chemical costs.

The large chemical costs in Tables I and II can be attributed to the following:

a) Fresh solution-to-product weight ratio of 8 to 1 during presoak and reaction and the subsequent loss of 10% of the used solutions in recovery. This includes loss of acetic anhydride, acetic acid, and isopropyl acetate. At the present state of process development it was found necessary to use fresh redistilled chemicals for each batch. This necessitated the recovery, by distillation, of approximately 2149 pounds of chemicals for each batch of 213.4 pounds of product. Process improvements directed toward reuse of portions of reaction and presoak solution without distillation should result in lower chemical cost.

b) In the reaction of acetic anhydride with cellulose, given above,

$$\text{CH}_3\text{C}(=\text{O})-$$

for each CH_3C(=O)—group reacted with cellulose, one mole of acetic acid is formed. The 90 percent of the acid formed that is recovered is valued at 10 cents per pound, for which the process is credited. The acetic anhydride from which the above acid is formed costs 14 cents per pound, and since the acetic acid recovery cost is estimated at one cent per pound, there is a cost to the process of five cents for each pound of acid formed and recovered. There is an additional cost to the process of 12 cents for that amount of anhydride used in forming each pound of acid that is not recovered.

c) Acetic anhydride carried on the cotton into the wash water is converted to acetic acid with the attendant cost of five cents per pound and 12 cents per pound reported in "b" above. Ten percent of the isopropyl acetate carried on the cotton into the wash water is also lost at a cost of 11.5 cents per pound.

d) Additional acetic anhydride is used to react with 6.5 percent moisture in the cotton, and the water in the presoak and in catalyst solutions.

Figures 2 and 3 show that operation of one, two, and four jigs results in

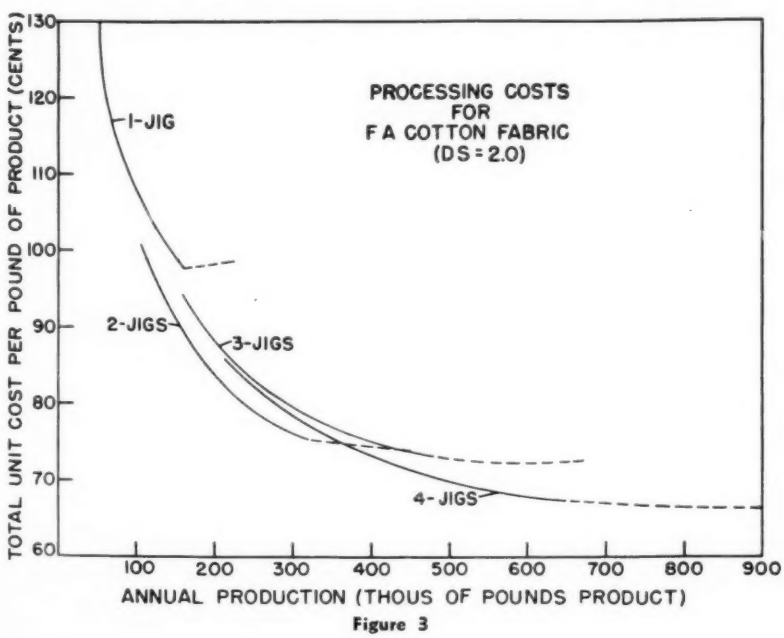


Figure 3

TABLE II
Net total chemicals cost per batch

			Cents per pound of product	Cents per yard
Acetic anhydride	Total		22.76	9.72
		¢/pound product		
Reacted with cellulose:		5.50		
Acetic acid by-product formation:		5.50		
Reacted with water in presoak and catalyst solution:		1.39		
Lost in recovery of reaction solution:		3.60		
Carried into wash water:		6.77		
		22.76		
Acetic acid	(Total net gain)		—4.24	—1.80
Lost in recovery process:		7.34		
Gained by formation:		11.58		
Isopropyl acetate				
Lost in recovery process (10%)			1.84	0.79
Perchloric acid			1.01	0.43
Potassium acetate			0.33	0.14
Recovery cost at 1¢ per pound of chemicals recovered			10.07	4.30
Net total chemicals			31.77	13.58

minimum costs over the production range studied. A three-jig installation would only be desirable from the standpoint of increasing capacity above that of two-jig installation. Proration of labor has a significant influence on the relative merits of the multi-jig installations. In this particular study an additional operator was allowed for the three-jig installation. This substantially increased the unit labor cost for this installation and is largely responsible for the unfavorable showing of the three-jig installation. It was determined in this study, using current market prices of chemicals, that a fabric product, having a DS of 2.0, can be produced by the batch process at its present state of development at a cost of 55.5¢ down to 28.3¢ per linear yard. These costs, expressed on a square yard basis (allowing for a shrinkage of 8% in fabric length only), are 36.2¢ down to 18.5¢; and, expressed as cents per pound of product, are $1.30 down to 66.3¢ per pound of treated fabric. It is believed under certain conditions, due to contract purchasing or captive supply, that the chemicals cost can be as much as 30 to 40 percent less than that calculated using current market prices. Such lower chemical costs and future process improvements could possibly reduce the overall processing costs by as much as one-third.

CONCLUSION

This chemical modification of cotton which imparts to it excellent electrical insulating properties, heat and rot resistance, and flat abrasion resistance, should enable better competition in the industrial field and in specialized uses where cotton does not now compete. In addition, this product has a low moisture regain, some thermoplasticity, and is dyeable with acetate colors (2).

These improved properties of FA cotton may eventually justify the cost of large-scale production.

ACKNOWLEDGMENT

The authors wish to acknowledge with thanks the assistance provided by the following personnel of the Engineering and Development Laboratory, Southern Utilization Research and Development Division:

H L E Vix, principal chemical engineer, for his many helpful comments.

G I Pittman, engineering draftsman, for the preparation of drawings.

Claire L Weber, statistical clerk, for the preparation of tables.

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Abstracts

Resin-treated Glass Cloths

Hyde, J K, *Fibres & Plastics 21*, 169-71, June, 1960

The combination of synthetic resins with glass-fiber base materials in various forms, eg, mat, rovings, woven cloth, etc, is now a well-established practice in a very wide field of applications, including aircraft radomes, motor-car bodies, and electrical insulation materials. Two different methods of producing these reinforced structures are described.

The types of glass cloth available for resin treatment are limited only by the bulk or thickness of the cloth. Glass cloths thicker than about 0.020 inch are in the main unsuitable for resin treatment, as difficulties are met in saturating the cloth, ie, completely filling all the air spaces. For general purposes, glass cloths between 0.005 and 0.010 inch thick are found most satisfactory.

The synthetic resins which find commercial use in combination with glass cloths are the phenolic, melamine, epoxy, polyester and silicone types. All of these are used to produce flat sheet laminates for electrical insulation purposes. Round and rectangular tubes and molded angles are also produced, mainly for electrical uses.

For structural applications, polyester resins are used principally, with some epoxy and silicate resins in specialized fields, eg, chemical and aircraft. Silicone resin-treated glass cloth finds uses requiring high heat resistance up to 250°C, and for low loss in electrical insulation.

It should be understood that the end application may well limit the choice of resin to be used. As a general guide, phenolics, melamine and silicone resin-treated cloths require relatively high pressures (of the order of 500-1200 psi). For the production of flat sheets and moldings, etc, at low pressures (5-200 psi) polyester, epoxy and some silicone resins are essential.

It is quite necessary to review all the points involved before selecting a particular resin for a particular job.

•

The Case for Hospital Blankets

Anon, *New Zealand Textile J*, Summer, 1959-60, 53-5

The apparent difficulty of effectively cleansing and sterilizing woolen blankets at frequent intervals without causing them to deteriorate rapidly has led many hospitals to try out substitutes for woolen blankets.

The following types of nonwoolen

(*concluded on page 81*)

Proceedings of the
American Association of Textile Chemists and Colorists
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November 14, 1960 No. 24

1960 Intersectional Contest First-prize winner———

CHEMICAL MECHANISMS IN CHLORINE RETENTION BY RESIN-TREATED COTTON FABRICS*

PIEDMONT SECTION

The program was a study of the chemical reactions involved in the chlorination of cross-linking resins on fabrics and *in vitro* and of the reactions involved in the decomposition of the chloramides formed.

It is shown that a reaction takes place competing with chloramide formation in which active chlorine destroys the nucleus of certain resins.

Studies have been made on rate of loss of chlorine from the resinated fabrics under a range of storage conditions.

The decomposition rates of different resin chloramides and the capacities of the resins to neutralize hydrochloric acid formed have been determined.

A mechanism for chloramide decomposition to hydrogen chloride on cellulose has been established and a mechanism for its inhibition has been demonstrated. Damage to cellulose fabrics from resin chloramides at high temperatures is shown to be due primarily to hydrogen chloride rather than to oxidative attack of active chlorine on the cellulose.

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INTRODUCTION

DAMAGE due to retained chlorine is a problem which has plagued finishers since they first began using resin treatments on cotton fabrics. When the first urea-formaldehyde-finished cotton fabrics were bleached with household bleaching agents, the results were disastrous. At times the fabric simply fell apart under a hot iron. Needless to say, the results were most discouraging to textile finishers and to the marketers of cotton fabrics. It had been hoped that resin treatments would upgrade cotton fabrics to overcome the competitive limitations of severe creasing during wear and shrinkage during laundering. An answer was sought in the development of more complex resins but these have generally introduced other deficiencies. The melamine resins, although resistant to chlorine degradation, are caused to yellow by chlorine, for example. Other improved resins have followed, each with its particular advantages and disadvantages (*25*).

Attempts to satisfy the obvious need for a method for evaluating the resistance of a resin-treated fabric to degradation from chlorine bleaching have been only partially successful because of difficulties experienced in reproducing the testing procedures in different laboratories and with different resin treatments (*42,43*). This has indicated that the chemistry of the whole chlorination phenomenon is complex and that different things can happen to resin-treated fabric chlorinated with household bleach depending on the conditions of chlorination, the conditions to which the chlorinated fabric is subjected in testing or in use, and the course of the reaction of the hypochlorite with the different resins.

Although some early chemical studies were made on resin-treated rayon (*1*), neither the published literature nor discussions in the various committees organized to study resin-treated fabrics have revealed an organized attempt to establish in detail the chemistry of what happens when cotton fabrics treated with resins now commonly in use are bleached with chlorine. Therefore, the need is evident for a systematic study of chlorine retention on resin-treated cotton fabrics.

OBJECTIVES

The broad objective of this study was to obtain a better understanding of the chemistry involved in the chlorine retention of resin-treated fabrics under practical manufacture and use conditions. It is believed that the use of an original and unique approach to the problem with careful systematic collection of data will provide a clearer understanding of the

*Presented by R L Wayland Jr on October 7 during the 1960 Intersectional Contest at the Hotel Sheraton, Philadelphia, Pa

* Now of Verona Dyestuffs
** Now of Deering Milliken Research Corp
*** Now of Koppers Co

phenomenon. It is hoped that a better understanding of the fundamental aspects of the phenomenon will lead to clearer nontechnical explanations which will help to remove any misunderstanding now in the minds of nontechnical people in the textile trade.

It is certain that a more complete knowledge of chlorine retention on resin-treated fabrics during use will establish a basis for the development of more reproducible tests than we now have. It is also a most important objective to point the path to better means of counteracting chlorine damage than those now available. Such means could be either through the development of resins more carefully tailored to resist chlorine damage than those now available or through the suggestions of agents to inhibit chlorine damage once the mechanism is completely understood. Another objective is to provide a complete bibliography of recent literature dealing with the problem of chlorine retention. A final and most important objective of this study is to point out the additional work which is needed as this study cannot be complete in itself.

Because of the breadth of the subject matter, this paper is limited to summarizing and highlighting the tremendous volume of experimental work done in the laboratories of the participants. The details of the various portions of the study with supporting data will be published later.

THEORETICAL BACKGROUND

It has never been seriously questioned that chlorine retention involves the formation of chloramides by action of the hypochlorite on amido groups in the resin on the fabric since the reaction of hypochlorite with urea, melamine, and similar resin nuclei to form chloramides has been known for a long time (*26, 27, 28*).

An oxidation-reduction type of reaction has also been known between hypochlorite and compounds of the type found as resin nuclei. These reactions are similar to the Hoffmann reaction of amides with hypohalites and, in the case of ureas, proceed through the formation of hydrazines as an intermediate step. For urea, the reaction may be written as follows (*29*):

$$NH_2-\overset{\overset{O}{\|}}{C}-NH_2 + 3\ NaOCl \rightarrow N_2 + CO_2 + 3NaCl + 2H_2O$$

The importance of this type of reaction in the chlorine-retention phenomenon has apparently never been fully realized. The fact that urea resins are partly decomposed by hypochlorite has been pointed out by Aenishaenslin (*12*). Most other workers in the field of chlorine retention have either ignored the degradative effects of hypochlorite on resins or have attributed the evidences of resin degradation solely to hydroiytic conditions encountered during laundering or by acid released by retained chlorine during ironing. Due to the nature of the techniques used by previous investigators (*1*), they have not determined the chlorine balance (fate of all chlorine in the system), and consequently they have not realized the extent to which the chlorine from the hypochlorite was consumed in the oxidation-reduction reaction. They have only measured the initial hypochlorite concentration and the chlorine retained by the fabric at equilibrium. When these values only are measured, it is impossible to detect losses of active chlorine from the system due to side reactions, or to measure accurately the relation of retained chlorine to the true equilibrium hypochlorite concentration. Such incomplete measurements not only fail to show the presence of the oxidation-reduction reaction, but also give the false impression that retained chlorine increases with increasing bath-to-fabric ratio.

It is generally accepted that the chlorine decomposes on heating, giving rise to hydrogen chloride, which causes the fabric damage by acid hydrolysis of cellulose linkages at the temperature of ironing or pressing (*5*). It is obvious that, in going from the chloramide to hydrogen chloride, the chlorine must be reduced. However, nowhere in the literature has a mechanism been proposed for this reduction nor has the source of the hydrogen atom necessary to form hydrogen chloride been established.

Many nitrogenous resin mixtures have been developed which show reduced tendency to produce strength loss due to chlorine retention because of built-in buffering action. However, little attention has been given to quantitative measurement of this buffering action. In fact, methods employed in previous studies of chlorine retention (*18*) have not permitted the isolation of the buffering effect of resins from other factors influencing chlorine damage, such as chloramide stability.

EXPERIMENTAL PROGRAM

The experimental program of this study has involved the following:

1) A study of the absorption of chlorine by the resin-treated fabric under various temperatures and pH conditions to determine the amount of chlorine retained by the various fabrics under the various conditions.
2) A study of reactions taking place in the chlorination bath other than chloramide formation to determine their nature and extent, especially oxidation-reduction-type reactions which might result in loss of active chlorine from the chlorination bath system and loss of crease resistance on the fabric due to resin degradation. The study has involved the use of actual resin-treated fabric and also resin nuclei *in vitro*.
3) A study of the stability of chloramides of the various resins at room temperature and at elevated temperature to determine the relative rates of decomposition of these chloramides.
4) A study of the decomposition of resin chloramides *in vitro* and on the fabric in order to establish the mechanism of the decomposition.
5) A study of the capacity of various resins to buffer hydrochloric acid to determine to what extent these resins protect the fabric from chlorine damage by neutralization of the hydrogen chloride formed from chloramide decomposition.

DISCUSSION

CHLORAMIDE FORMATION—If it is assumed that chloramide formation is an equilibrium reaction and that it is the primary reaction involved in chlorine retention, a mechanism for this reaction might be proposed which would involve the following reactions:

$$NaOCl \leftrightharpoons Na^+ + OCl^-$$

$$OCl^- + H^+ \leftrightharpoons HOCl$$

$$HOCl + -\overset{\overset{H}{|}}{C}-NH \leftrightharpoons -\overset{\overset{H}{|}}{C}-NCl + H_2O$$

If we let the symbol **NH** stand for amide-type groups on the resin and **NCl** for the chloramide, then the reaction constants can be written as follows:

$$K_2 = \frac{[HOCl]}{[OCl^-][H^+]} \qquad K_3 = \frac{[NCl]}{[HOCl]\,[NH]}$$

Combining equilibrium constants K_2 and K_3, a constant for the overall reaction is obtained

$$K = \frac{[NCl]}{[H^+][OCl^-][NH]}$$

If the initial number of amide groups in the resin is NH°, then

$$[NH] = [NH^\circ] - [NCl]$$

and

$$K = \frac{[NCl]}{[H^+][OCl^-]x[NH^\circ]-[NCl]}$$

At constant pH, this becomes

$$K' = \frac{[NCl]}{[OCl^-]x[NH^\circ]-[NCl]}$$

This equation is an equation for an hyperbola in which the NCl concentration approaches the NH° value as an asymptote as the OCl^- concentration increases. It might be expected that NH° values, and also the K' values would be different for different

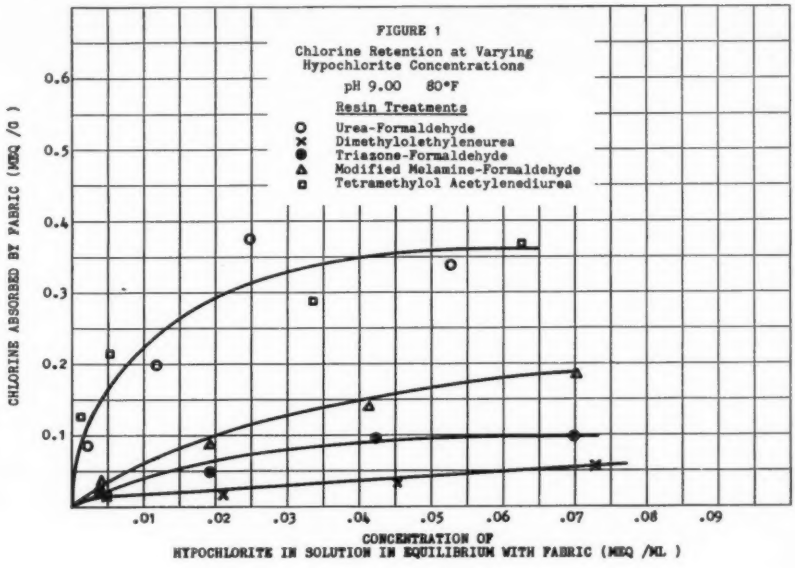


TABLE I
Fate of active chlorine
Chlorine at 80°F and pH 9.95

Resin on fabric	*Initial total chlorine in system (meq)*	*Amount of active chlorine on fabric (meq)*	*Amount of active chlorine in bath (meq)*	*Amount of active chlorine loss (meq)*	*Concentration of active chlorine in bath (meq/ml)*	*Concentration of active chlorine on fabric (meq/g)*
Urea-formaldehyde	10.010	.9569	6.370	2.6831	.0490	.3531
	6.201	.8483	4.368	.9847	.0336	.3219
	.7904	.3299	.260	.2005	.0020	.1254
	.4017	.1791	.1001	.1225	.00077	.0685
Dimethylol ethyleneurea	10.010	.0803	9.672	.2577	.0744	.0306
	6.201	.0543	5.923	.2237	.0456	.0209
	.7904	.0301	.6412	.1191	.0049	.0115
	.4017	.0214	.2795	.1008	.00215	.0081
Triazone-formaldehyde	10.010	.1777	9.386	.4463	.0722	.0663
	6.201	.1415	5.616	.4435	.0432	.0531
	.7904	.0586	.546	.1858	.0042	.0222
	.4017	.0373	.1963	.1681	.0015	.01419
Modified melamine-formaldehyde	10.010	.4066	9.074	.5294	.0696	.1529
	6.201	.2620	5.590	.3490	.0630	.1009
	.7904	.0839	.572	.1345	.0044	.0324
	.4017	.0521	.2062	.1434	.0016	.02018
Tetramethylol acetylenediurea	10.010	.9747	7.956	1.0793	.0612	.3655
	6.201	.8362	4.636	.7288	.0357	.3161
	.7904	.3342	.182	.2742	.0014	.1280
	.4017	.1177	.0398	.2442	.0003	.0412

TABLE II
Fate of active chlorine
Chlorination at 80°F and pH 9.00

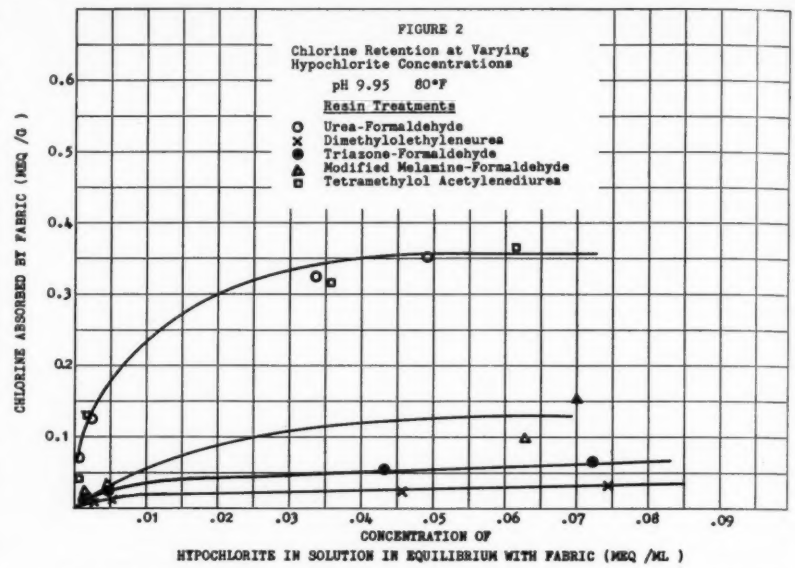
Resin on fabric	*Initial total chlorine in system (meq)*	*Amount of active chlorine on fabric (meq)*	*Amount of active chlorine in bath (meq)*	*Amount of active chlorine loss (meq)*	*Concentration of active chlorine in bath (meq/ml)*	*Concentration of active chlorine on fabric (meq/g)*
Urea-formaldehyde	10.062	.8927	6.877	2.292	.0529	.3364
	6.136	1.0013	3.211	1.924	.0247	.3713
	3.068	.5161	1.560	.992	.0120	.1971
	.782	.2335	.286	.262	.0022	.0877
Dimethylol ethyleneurea	10.062	.1380	9.516	.408	.0732	.0520
	6.136	.0873	5.902	.147	.0454	.0334
	3.068	.0414	2.756	.271	.0212	.0160
	.782	.0312	.616	.135	.0047	.0120
Triazone-formaldehyde	10.062	.2612	9.061	.740	.0697	.0976
	6.136	.2540	5.486	.396	.0422	.0956
	3.068	.1257	2.496	.443	.0192	.0485
	.782	.0695	.510	.202	.0039	.0258
Modified melamine-formaldehyde	10.062	.4741	9.165	.423	.0705	.1829
	6.136	.3520	5.382	.402	.0414	.1368
	3.068	.2244	2.522	.322	.0194	.0867
	.782	.0913	.530	.161	.0041	.0346
Tetramethylol acetylenediurea	10.062	.9522	8.151	.959	.0627	.3643
	6.136	.7528	4.394	.989	.0338	.2880
	3.068	.5597	.702	1.806	.0054	.2127
	.782	.3190	.166	.297	.0013	.1206

resins. Thus the curves obtained by plotting OCl^- concentrations against NCl concentrations for different resin treatments should all be hyperbolas having the origin as a vertex but having different foci and asymptotes.

These statements and the equations mean that some resins will form chloramides more readily than others and that some chloramides will decompose more readily than others, depending on their particular K′ values. Likewise the NH^0 values, representing the amide groups in the resin available for chlorination and being characteristic of the resin, mean that each resin has its own maximum amount of chlorine which it can absorb. This will be referred to later in discussing the differences in resin properties both when chlorinated and when heated after chlorination.

The resin treatments used here and throughout this study were urea-formaldehyde, dimethylolethylene urea, triazone-formaldehyde, modified melamine-formaldehyde, and tetramethylol acetylenediurea applied as stated in the "Experimental" section of this paper. The results of the studies on chlorine absorption by the resin-treated fabrics under the conditions set forth above are shown graphically in Figures 1, 2 and 3 and in Tables I, II and III.

It can be seen from the figures that, as the hypochlorite concentration in the chlorination bath rises, the chlorine absorbed by the resin-treated fabrics rises rapidly at first, then levels out at a maximum value which is characteristic for each resin. Since no attempt was made to establish true equilibrium conditions and since work reported in a later section of this paper shows that there are other reactions competing with the chloramide formation in the chlorina-



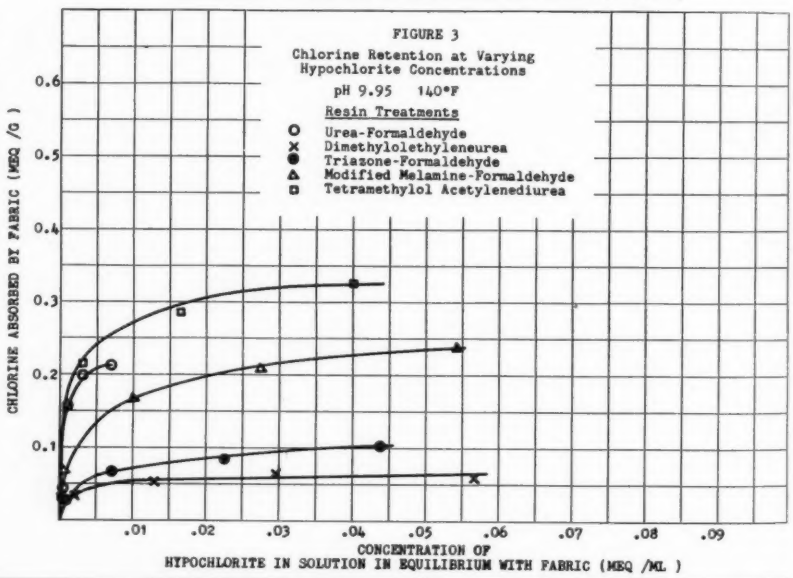


TABLE III
Fate of active chlorine
Chlorination at 140°F and pH 9.95

Resin on fabric	*Initial total chlorine in system (meq)*	*Amount of active chlorine on fabric (meq)*	*Amount of active chlorine in bath (meq)*	*Amount of active chlorine loss (meq)*	*Concentration of active chlorine in bath (meq/ml)*	*Concentration of active chlorine on fabric (meq/g)*
Urea-formaldehyde	9.906	.559	.897	8.550	.0069	.2127
	6.058	.542	.402	5.113	.0031	.2029
	3.068	.400	.124	2.536	.0010	.1577
	.780	.093	.026	.661	.0002	.0357
Dimethyolol ethyleneurea	9.906	.160	7.384	2.362	.0568	.0616
	6.058	.173	3.835	2.050	.0295	.0656
	3.068	.135	.168	2.752	.0129	.0520
	.780	.081	.208	.491	.0016	.0315
Triazone-formaldehyde	9.906	.274	5.681	3.951	.0437	.1026
	6.058	.218	2.873	2.967	.0221	.0825
	3.068	.174	.091	2.796	.0070	.0658
	.780	.065	.034	.681	.0003	.0246
Modified melamine-formaldehyde	9.906	.616	7.033	2.257	.0541	.2386
	6.058	.532	3.549	1.977	.0273	.2086
	3.068	.415	.130	2.512	.0100	.1622
	.780	.177	.083	.519	.0006	.0681
Tetramethylol acetylenediurea	9.906	.845	5.200	3.861	.0400	.3259
	6.058	.748	2.119	3.191	.0163	.2842
	3.068	.558	.039	2.468	.0030	.2129
	.780	.075	.031	.674	.0002	.0290

TABLE IV
Household bleaching of fabric
Retained chlorine
(% Chlorine retained)

A) CLOROX—SOAK

	1st Cycle				3rd Cycle			
	Rinsed	*Washed*	*Dried*	*Ironed*	*Rinsed*	*Washed*	*Dried*	*Ironed*
U/F	0.076	0.023	0.021	0.017	0.072	0.013	0.018	0.008
EU/F	0.026	0.008	0.008	0.006	0.0029	0.015	0.013	0.012
M/F	0.044	0.016	0.012	0.010	0.081	0.036	0.025	0.027
T/F	0.034	0.006	0.002	0.004	0.038	0.013	0.014	0.020
ADU/F	0.054	0.016	0.006	0.004	0.201	0.062	0.051	0.043

	5th Cycle			
	Rinsed	*Washed*	*Dried*	*Ironed*
U/F	0.0116	0.017	0.011	0.012
EU/F	0.039	0.016	0.019	0.019
M/F	0.098	0.056	0.067	0.036
T/F	0.047	0.018	0.014	0.013
ADU/F	0.188	0.109	0.102	0.059

B) CLOROX—WASH

(% Chlorine retained)

	1st Cycle			3rd Cycle			5th Cycle		
	Washed	*Dried*	*Ironed*	*Washed*	*Dried*	*Ironed*	*Washed*	*Dried*	*Ironed*
U/F	0.185	0.178	0.148	0.278	0.262	0.210	0.300	0.287	0.234
EU/F	0.030	0.030	0.026	—	—	—	0.061	0.062	0.057
M/F	0.123	0.122	0.115	0.221	0.238	0.208	0.314	0.333	0.342
T/F	0.046	0.046	0.039	—	—	—	0.086	0.086	0.077
ADU/F	0.311	0.316	0.300	0.420	0.418	0.402	0.453	0.450	0.455

TABLE V
Household bleaching of fabric
Physical properties

	Original			After five Tide washes			After five Clorox-soaks & five Tide washes			After five Clorox-washes with Tide		
Resin	*Grab tensile*	*Crease recovery*	*Reflect*	*Grab tensile*	*Crease recovery*	*Reflect*	*Grab tensile*	*Crease recovery*	*Reflect*	*Grab tensile*	*Crease recovery*	*Reflect*
Untreated	125	155	2.7	110	147	0.3	104	161	1.9	98	165	1.8
U/F	93	223	2.8	90	204	1.6	78	194	2.4	59	163	2.2
EU/F	80	259	3.2	76	241	2.0	84	229	2.3	87	193	2.3
M/F	95	234	2.8	89	217	1.9	89	208	3.5	85	196	5.6
T/F	83	244	2.8	80	230	1.9	85	216	2.4	79	205	2.1
ADU/F	88	216	2.5	92	204	2.0	82	192	2.5	62	177	2.3

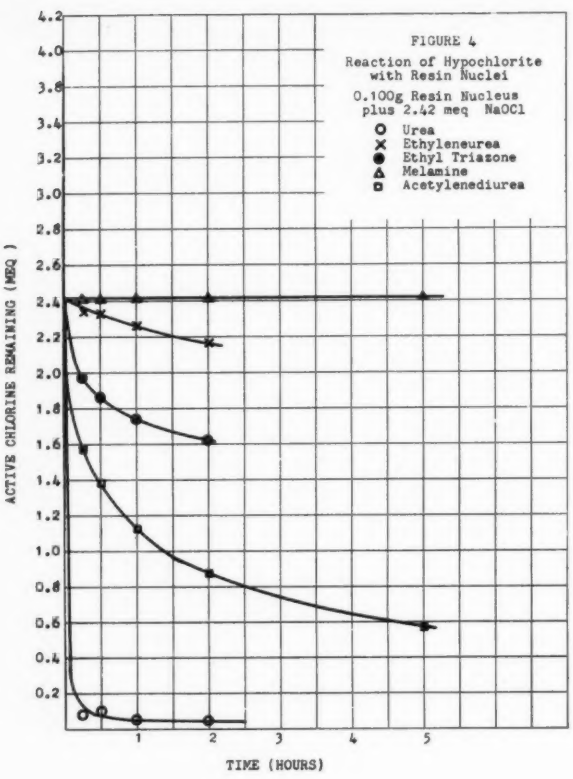
Note:
Grab tensile value is the sum of the warp-filling values in pounds.
Crease recovery value is the sum of the warp-filling values in degrees.
Reflectance is the b value—yellowing (Gardner Reflectometer).

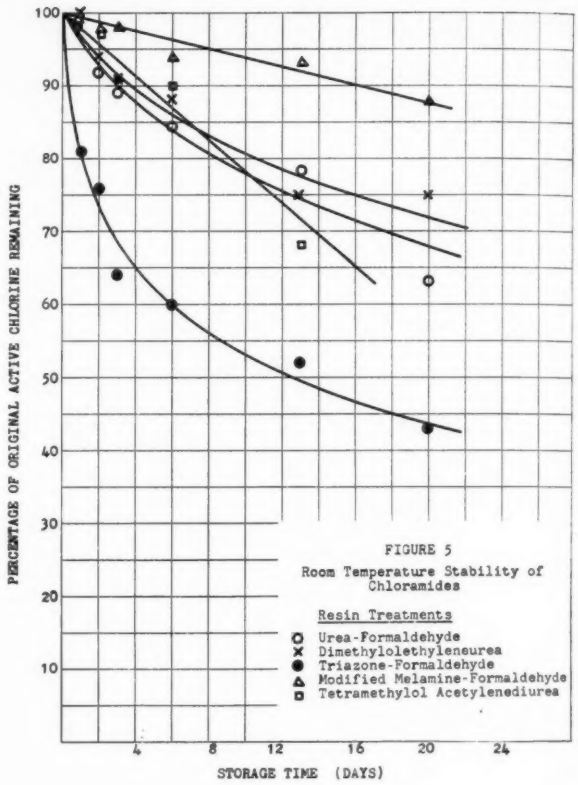
tion bath, it can hardly be hoped that curves obtained in this study would follow at all closely curves predicted by calculations from equilibrium constants. It is interesting to note, however, that the data obtained, when plotted, takes at least the approximate form of the theoretical curves.

OXIDATION REACTIONS IN THE CHLORINE BATH———From examination of Tables I, II and III it is evident that the hypochlorite concentrations after fifteen minutes are much less than the original concentrations in the bath, especially at low initial concentrations and/or high temperatures. In some instances the amount of active chlorine absorbed by the fabric and reduced by side reactions is much more than that left in solution at the end of the chlorination period. This fact makes evident the importance of measuring the equilibrium concentration of hypochlorite in a chlorination-bath as well as the initial hypochlorite concentration when making chemical studies of chlorine-retention reactions. It also shows clearly that oxidative reactions are taking place in the chlorination bath to a considerable extent as evidenced by reduction of the total amount of active chlorine in the chlorination bath system during the bleach cycle. Some loss of active chlorine due to bleaching action on the fabric is expected, but the fact that the degree of active chlorination loss varies with the resin type is an indication that the resins themselves are involved in the oxidation reaction.

Early in the work of the Committee, a study was made of bleaching during home laundering according to the directions of the bleach manufacturers. The results of this study are shown in Tables IV and V. They clearly indicate greater loss in crease resistance by resin-treated fabrics on which bleach was used than on the same fabrics which were given the same laundering treatment without bleach. They also indicated that the use of hypochlorite in the wash cycle at 140°F results in more crease-resistance loss than does the use of hypochlorite in a room temperature soak followed by laundering. This study did not preclude the possibility that the greater crease resistance loss on the bleached fabric might have been caused by degradation of the resin by acid released from chlorine retained on ironing since the fabrics were ironed after each wash. In order to clear this up, selected fabrics were washed both with and without hypochlorite bleach and with and without ironing. Results of this work gave a definite indication that resin degradation was taking place in the bleaching bath.

Once the degradative attack of hypochlorite on resins had been established, a question of the site of the attack on resin structure arose. To obtain some light on this question, a study was made *in vitro* of the effect of hypochlorite on resin nuclei and their derivatives. It was found that derivatives of resin nuclei in which all the amide hydrogen had



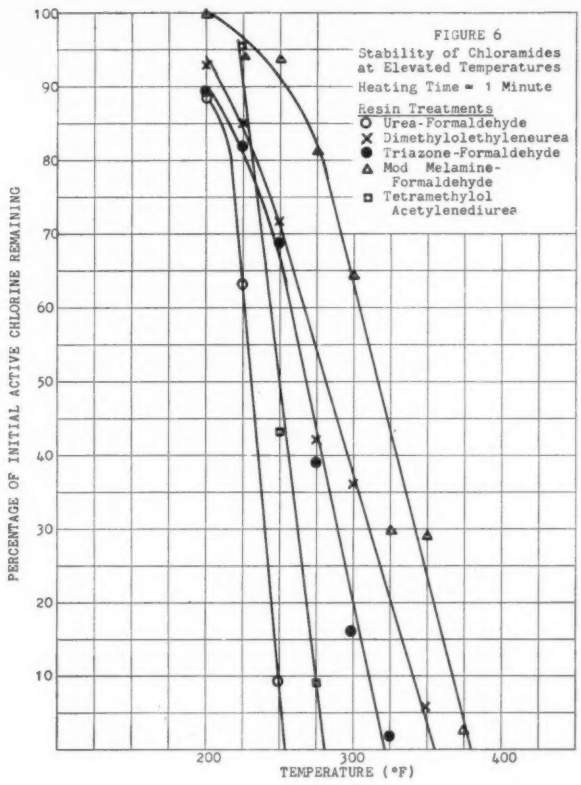


been replaced by alkyl groups were not reactive toward hypochlorite at room temperature. Urea was found to react quite rapidly with hypochlorite according to the equation already given in the "Theoretical Background" section with loss of active chlorine from the reaction system and with evolution of nitrogen. Melamine did not reduce the active chlorine content of a melamine-hypochlorite mixture appreciably even after several hours at room temperature. The nuclei of the other resins used in this study reacted with hypochlorite to reduce it at intermediate rates. The results of the *in vitro* studies of the action of hypochlorite on resin nuclei are shown graphically in Figure 4. In relating such *in vitro* studies to actual resin-treated fabrics, care should be taken since the reacting groups of the resin will certainly not be in exactly the same steric and electronic configurations as the reacting groups of the compounds used in the *in vitro* studies. As an example, it would not be expected that urea resins where many of the amide hydrogens are blocked by extensive branching, polymerization, etc, would be as active toward hypochlorite as is urea itself. It seems reasonable to assume, however, that the reactions with hypochlorite which take place with resin nuclei would take place to some degree with the resins themselves. The combination of the results of the *in vitro* studies and the studies of the effect of hypochlorite on resin-treated fabrics seems to indicate clearly that an oxidative attack of hypochlorite on resin-treated fabrics takes place to a considerable extent in the chlorination bath and that this attack most probably takes place at free NH groups in the resin molecule.

STABILITY OF RESIN CHLORAMIDES——At the time this study was begun there was no published information available concerning the stability at room temperature of the chloramides formed by chlorination of resin-treated fabrics. From a practical viewpoint it would be helpful to know how long chlorine would be held by a fabric once it had been absorbed. In this study, chlorinated resin-treated fabrics were held for a period of three weeks. Titrations for remaining active chlorine were made on portions of each fabric at regular intervals. As shown in Figure 5, considerable difference was found among resins in regard to the stability of the chlorine which they had retained. The triazone-formaldehyde resin was found to lose its retained chlorine quite rapidly. The modified melamine-formaldehyde resin was found to lose its retained chlorine very slowly. The other resins lost retained chlorine at intermediate rates.

Once the disappearance of active chlorine from the fabric had been established, an attempt was made to determine whether the active chlorine was actually leaving the fabric or was only being reduced to chloride ion. In order to make this determination, a piece of chlorinated triazone-resin-treated fabric was stored at 72°F and 65% RH and samples of the fabric were titrated for active chlorine and for total chlorine at intervals. By this method it was shown that both the active chlorine and the total chlorine content of the fabric fell on storage at room temperature. This indicated that at least some of the active chlorine was actually leaving the fabric as chlorine gas or as some other volatile chlorine compound.

Previous investigations (*18*) have indicated that the stability of the chloramide formed on hypochlorite bleaching varies with the resin and that the chloramides of some resins decompose at lower temperatures



than those of others. In this study chlorinated samples of the various resin-treated fabrics were heated for a given time at varying temperatures and the amount of chloramide remaining after the heat treatment was determined by thiosulfate titration. By fixing the heating time at one minute and plotting the percent chlorine remaining against the temperature of heating, the curves shown in Figure 6 were obtained. The temperature at which one-half of the chlorine remained after one minute could be interpolated for each resin. The temperatures for which $t_{1/2} = 1$ minute for the various resin-treated fabrics are as follows:

Resin	*Temperature at which* $t_{1/2} = 1$ *minute*
Modified melamine	318°F
Dimethylolethylene urea	282
Triazone	270
Tetramethylol acetylenediurea	250
Urea-formaldehyde	231

The highest temperatures for $t_{1/2} = 1$ minute indicate chloramides of greatest stability.

The stability of the resin-chloramide is important to the overall picture of chlorine retention and damage, especially from a practical viewpoint because, if we assume for the moment that fabric damage is caused by acid released by chloramide degradation, then a resin which retains much chlorine as a very stable chloramide may show less fabric damage on moderate ironing than another resin which retains less chlorine as a very unstable chloramide. In other words, the chloramide must not only form but some must be decomposed in order that the fabric be damaged. The amount of chloramide which decomposes will be determined not only by the amount originally present and the time and temperature of heating but also by the stability of the chloramide.

RESIN CHLORAMIDE DECOMPOSITION AND HYDROGEN CHLORIDE FORMATION——As pointed out eariler, it has been commonly accepted that resin chloramides decompose on heating, giving rise to hydrogen chloride which then damages the fabric; however, the mechanism of the hydrogen chloride formation has never been elucidated.

In this study it has been observed that melamine resins, when applied to glass fabric, will retain chlorine, although in smaller amounts than when applied to cotton fabrics; but when the resin-treated glass fabrics with retained chlorine are heated, no hydrogen chloride can be detected. Resin-treated cotton fabrics having retained chlorine, however, are tendered and give off a considerable amount of hydrogen chloride when heated. Results of this work are shown in Table VI. These results indicated that perhaps cotton itself was involved in the mechanism of chloramide decomposition to produce hydrogen chloride and suggested that a study of the chloramides of resin nuclei *in vitro* in the presence of various substrates would be of interest.

Monochloromelamine, when heated alone, liberated chlorine as chlorine gas, but when monochloromelamine was heated in the presence of polyvinyl alcohol, water was produced and the chlorine was found organically combined in the residue. With methyl cellulose, the chlorine appeared principally as hydrogen chloride.

These experiments seemed to indicate that, on heating, the chloromelamine might be decomposing, liberating chlorine radicals. In the absence of a reactive substrate (as for example on glass fabric) these radicals could combine and form chlorine gas. If reactive hydrogen atoms are present, as in polyvinyl alcohol, methyl cellulose, or cotton, the chlorine radicals could abstract a hydrogen atom to form hydrogen chloride. In the case of polyvinyl alcohol, dehydration can occur with the liberation of water and the formation of unsaturated bonds. The latter then absorb nearly all the chlorine radicals, which finally are detected in organic combination. With methyl cellulose and with cellulose itself the dehydration is less important. Most of the chlorine radicals form hydrogen chloride. This leads to the hydrolytic decomposition of the polymer chain. The series of reactions postulated above can be represented schematically as follows:

$$N\text{-}Cl \rightarrow N\cdot + Cl\cdot$$

$$2Cl\cdot \rightarrow Cl_2$$

$$Cl\cdot + \text{cellulose} \rightarrow HCl + \text{cellulose radical}$$

The ability of chlorine radicals to abstract hydrogen atoms from cellulose was demonstrated experimentally by irradiating chlorine gas in the presence of cotton fabric. The irradiation produces chlorine radicals from the chlorine gas. The formation of hydrogen chloride by chlorine radicals reacting with the cotton was confirmed by higher acidity and much greater loss of tensile strength on

TABLE VI
Chlorine retention: glass vs cotton

	Glass fabric		Cotton fabric	
	6% MF	6% UF	6% MF	6% UF
Chlorine in fabric, %	0.048	0.17	0.26	0.69
Total HCl formed, %	None	None	0.10	0.032
Tensile loss, % (AATCC Tentative Test Method 69-1958)	—	—	15.4	90.9

TABLE VII
Effect of unsaturated inhibitors
Tensile loss, thirty-six hours in Fade-Ometer

Sample	Unchlorinated	Chlorinated
Cotton control	17.8%	—
Cotton and TMDM	11.7	—
Resinated cotton	12.5	38.8%
Resinated cotton & TMDM	0.0	7.8

TABLE VIII
Effect of unsaturated inhibitors
Tensile loss, AATCC test

Sample	Resin only	Resin & inhibitor
Cotton and dimethylol urea	26%	10% (DMA)
Cotton and UF paste	100	63 (DMA)
DMEU (soured)	16	4.6 (TMDM)

TABLE IX
Effect of cobaltous inhibitors

Sample	% Active chlorine	% Tensile loss
UF resin only	0.275	60
UF resin and cobaltous acetate	.293	9.8
UF resin and sodium acetate	.202	10.3
UF resin and cobaltous nitrate	.280	23.5
UF resin and sodium nitrate	.293	58

cotton fabric exposed in this way than on a control sample exposed to chlorine gas in the dark.

If the hypothesis is correct that unsaturated bonds developed in the polyvinyl alcohol absorbed chlorine radicals, it seemed likely that other unsaturated compounds might act as inhibitors of chlorine damage in resin-treated fabrics. Such a compound was prepared by reacting diallyl melamine with formaldehyde. When chlorinated samples of resin-treated fabric containing this inhibitor are exposed to light, the results shown in Table VII are obtained. The data show that the unsaturated inhibitor has substantially reduced the damage in the chlorinated sample. It is also noted that this compound gives some protection both to the unfinished cotton and to the resinated cotton from direct degradation due to light.

A second sample of unsaturated inhibitor, dimethylolacrylamide (DMA), was synthesized. In this case, the chlorine radicals were liberated by heat instead of ultra-violet light. The results are shown in Table VIII. Here again the effect of the unsaturated free radical scavengers is demonstrated.

An entirely different type of reagent that could absorb chlorine radicals and thus reduce the strength loss in resinated cotton is the cobaltous ion. It might react as shown in the following equation:

$$Co^{++} + Cl^{\circ} \rightarrow Co^{+++} + Cl^{-}$$

Here the chlorine radical would be reduced to harmless chloride ion without the liberation of hydrogen chloride. The results obtained using cobaltous salts as inhibitors are given in Table IX with corresponding sodium salts as controls. The protection given by cobaltous nitrate provides further evidence for the hypothesis of attack through the free chlorine radical mechanism. Colbaltous acetate gave even more protection, but it is clear that the basic nature of this salt had much to do with its greater effectiveness since the sodium acetate control was just as effective as the cobaltous acetate.

The experiments on chloramide decomposition and hydrogen chloride formation, taken as a whole, strongly indicate that there is an attack on cellulose to extract a hydrogen atom. This attack, however, is not the major cause of fabric damage but is the means of forming hydrogen chloride which causes the major portion of the fabric damage by acid degradation.

BUFFERING POWER OF RESINS ——If the damage which results when fabrics with retained chlorine are heated is caused largely by hydrochloric acid, then the acid-neutralizing power of the fabric should influence the degree of fabric damage. It has been stated in the literature (*18*) that triazone and melamine resins have considerable buffering power and that these resins exert a protective effect on the fabric from chlorine damage by neutralizing hydrochloric acid formed from retained chlorine on heating.

In this study, the acid-neutralizing power of the various fabric resin treatments studied was measured by padding samples of the various fabrics with varying concentrations of hydrochloric acid. The results of this work are shown graphically in Figure 7.

It will be noted that all of the resin treatments appear to protect the fabric somewhat as evidenced by the fact that the untreated fabric loses the greatest percentage of strength of any of the fabrics at any given acid concentration. Only the triazone resin showed a strong acid-neutralizing power although the melamine resin gave an indication that it may have slightly more neutralizing power than the urea-formaldehyde, acetyleneediurea or ethyleneurea resins.

If the ranges of chlorine retention values found for various resins in a previous section of this study (see Figures 1, 2 and 3) are matched with the amounts of hydrochloric acid used in this experiment and the corresponding positions on the strength-loss curves for the various resins noted, it is found that the acid that could be formed from the range of chlorine retention found for ADU and UF resins would correspond to the flat, high-loss portions of the curves. This would indicate that chlorine damage by a test such as the AATCC Tentative Test Method 92-1958[1] might be expected to be high and quite reproducible. It should be noted in making this comparison that one milliequivalent of hydrogen chloride is equivalent to two milliequivalents of active chlorine.

The range of retention for the triazone resin corresponds to the flat, low loss portion of its strength-loss curve, indicating that low and reproducible damage could be expected. The range of retention for the ethyleneurea resin corresponds roughly to the steep portions of its strength-loss curve indicating that medium and quite variable chlorine damage values might be expected from the usual test methods. In general the expected behavior for these resins has been found in practice.

EXPERIMENTAL

PREPARATION AND RESIN TREATMENT OF FABRIC——The fabric chosen for use in the study was

[1]Cf 1959 AATCC Technical Manual, pages 130-131.

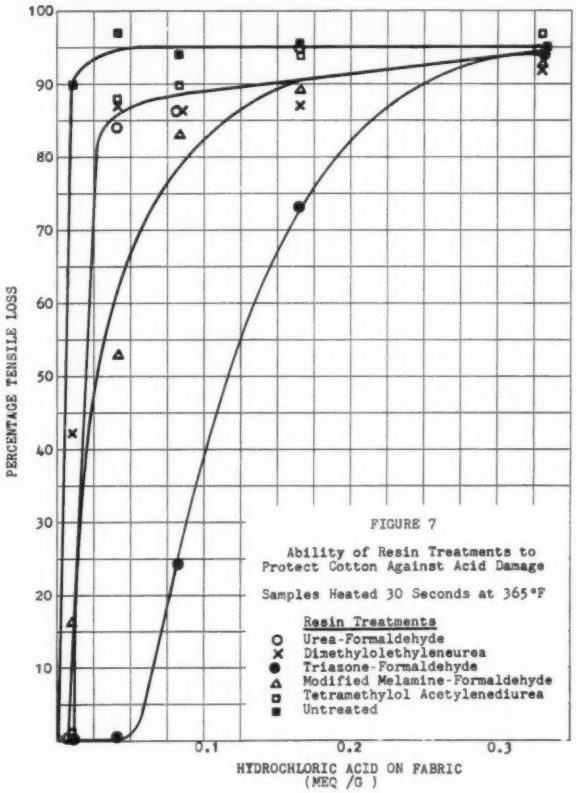


FIGURE 7

Ability of Resin Treatments to Protect Cotton Against Acid Damage

Samples Heated 30 Seconds at 365°F

80 × 80 print cloth. The greige cloth was singed, given an enzyme desize, washed, and kier boiled with caustic, detergents and sequestering agents under pressure. Following the kier boil, the fabric was washed, soured, washed again, and bleached with activated sodium chlorite. After bleaching, the fabric was washed, soured, washed again, neutralized, washed a third time, and dried. The resins were applied to the fabric in a manner which was considered conventional for the application of resins of the type used. The fabrics were padded single dip and single nip at six percent pickup and dried on a tenter frame. After drying, the fabrics were cured for 90 seconds at 310°F in a tight strand curing oven. Following the cure, the fabrics were washed well with 0.1% of a nonionic detergent and 0.1% soda ash at 150°F followed by thorough rinsing and then frame dried. The concentration of resin in the treating bath was adjusted so as to apply six percent resin solids to the fabric in each case. An amine - hydrochloride - type catalyst was used for curing the resins in order to avoid any unusual effects that metal salt catalysts might have on the chlorine retention of the finished fabrics. The five resin types chosen for study were urea-formaldehyde, modified melamine-formaldehyde, triazone-formaldehyde, dimethylolethyleneurea, and tetramethylol acetylenediurea. The nitrogen and total formaldehyde content of the resin-treated fabrics and the percent damage due to chlorine retention as measured by AATCC Tentative Test Method 92-58 immediately after finishing are reported in Table X.

TABLE X

Resin treatment	*% N*	*Meq N/g fabric*	*% Combined formaldehyde*	*Mole ratio CH_2O/N*	*% Chlorine damage by AATCC Test 92-58*
Urea-formaldehyde	1.28	.922	1.95	.705	88
Modified melamine-formaldehyde	1.24	.885	2.22		60
Dimethylol ethylene urea	1.11	.793	2.17	.911	70
Triazone-formaldehyde	1.05	.750	2.80	1.24	16
Tetramethylol acetylenediurea	0.97	.698	1.70	.812	95

Nitrogen was determined by the micro Kjeldahl method, using approximately 0.3-gram samples. The total hydrolyzable formaldehyde was determined by boiling approximately one gram of fabric for thirty minutes in 20 percent sulfuric acid. The liberated formaldehyde was collected in distilled water and determined by sodium sulfite-alkali titration in the usual manner. The chlorine damage values are the average of two determinations in separate laboratories. Differences in the values reported for the same resin by the different laboratories varied from one to 16 percent.

DETERMINATION OF ACTIVE CHLORINE ON FABRIC BY TITRATION —— Throughout this study a thiosulfate-iodine titration procedure was used for the determination of active chlorine on fabrics and in solutions. The method used was essentially the same as that used by Nuessle et al (*1*).

An accurately weighed sample of fabric containing retained chlorine was placed in an Erlenmeyer flask with just enough distilled water to cover the sample; five ml of glacial acetic acid and 10 ml of 20% potassium iodine solution were added. The flask was shaken or stirred for 15 minutes. The liberated iodine was titrated in the presence of the fabric with 0.01N sodium thiosulfate with starch as the indicator. The starch was not added until the color of iodine was very faint in order to obtain a sharper end point. Some samples, especially those treated with melamine resins, retained the iodine color after the solution had become clear. In these cases the true end-point was approached by continued shaking and stirring of the flask, sometimes for considerable periods of time, and very slow addition of thiosulfate until both fabric and solution were colorless.

The weights of the sample used were adjusted so as to require a reasonable amount of thiosulfate for titration, that is, 10-25 ml. For highly chlorine-retentive samples, such as those treated with urea and acetylenediurea resins, a sample of approximately two grams was usually employed. Some of the other less-chlorine-retentive fabrics required samples of up to 10 grams or more in order to require enough thiosulfate for the titration to be accurate.

The equations involved in the titration are:

$$\text{-}\ddot{\underset{\text{O}}{\text{C}}}\text{-NCl} + 2\text{KI} + \text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COOK} + \text{KCl} + \text{I}_2 + \text{C-NH}$$

$$\text{I}_2 + 2\text{Na}_2\text{S}_2\text{O}_3 \rightarrow 2\text{NaI} + \text{Na}_2\text{S}_2\text{O}_4$$

CHLORINE PICKUP OF FABRICS TREATED WITH VARIOUS TYPES OF RESIN DURING NORMAL HOME LAUNDERING——The bleaching procedures recommended by bleach manufacturers were employed. One, the hydrochlorite soak procedure, involves soaking the fabrics in a hypochlorite bleach at room temperature prior to washing; the other, the hypochlorite wash procedure, involves the addition of hypochlorite bleach directly to the automatic washer during the wash cycle. As a control, samples of the fabrics were also washed with a synthetic detergent without bleach. In the wash cycles where bleach was used, titrations for retained chlorine were made after the first, third, and fifth cycles.

Soak Procedure: The resin-treated fabrics were soaked in a commercial 5.25% sodium hypochlorite (Clorox) diluted 1/256 for one hour at room temperature at a fabric/liquor ratio of 1/25. The bleached fabric was subjected to a ten-minute rinse in a washing machine at 100°F ± 5°, washed at 140°F with a synthetic detergent (Tide) for twenty minutes, tumble dried, ironed with a hand iron and titrated for retained chlorine. The wet samples were air dried for 30 to 45 minutes before weighing. The entire procedure was repeated five times with titrations run after the 1st, 3rd, and 5th cycles.

Wash Procedure: This operation consisted of washing the fabrics for twenty minutes in water at 140°F with one-half cup of Tide and eight ounces of commercial 5.25% sodium hypochlorite solution per load. Care was taken to insure dilution of the bleach before the fabrics were introduced. The fabrics were tumble dried and ironed as previously described, and titrated for retained chlorine. This operation was also repeated five times with titrations being run after the 1st, 3rd and 5th cycles.

DETERMINATION OF CHLORINE ABSORPTION —— Resin-treated fabric samples of approximately two grams were accurately weighed and immersed in the chlorination bath at the specified liquor/cloth ratio for the specified time. At the end of the specified chlorination period, the sample was removed from the chlorination bath, squeezed to remove excess solution, placed in a tared stoppered flask and weighed. From the weights of the dry sample and the wet sample, the amount of bath liquor remaining in the sample was calculated. In calculating the amount of chlorine retained by the fabric, a correction for the amount in the liquor on the sample was made. After weighing, the fabric sample was titrated for active chlorine by the thiosulfate-iodine method, which was used throughout this study. A sample of the chlorination bath was also titrated immediately after the fabric sample was removed. Retained chlorine was calculated in units of milliequivalents of active chlorine per gram of dry fabric.

For chlorination baths at pH 10, the baths were made 0.1N in both sodium carbonate and bicarbonate. In practice, this gave a pH of 9.95, which was maintained throughout the bleaching times studied. The baths were made 0.1N in both boric acid and sodium borate to obtain pH 9.0. These baths were also found to be very stable against pH drift.

Temperatures during all chlorinations were held within ± 2°F of the specified temperatures.

In the experiments to determine the change of chlorine uptake by various resin-treated fabrics at varying initial hypochlorite concentrations, the general procedure outlined above was followed. Chlorination times of 15 minutes were used. The liquor/cloth ratio was 50/1.

OXIDATIVE ATTACK OF HYPOCHLORITE ON RESIN NUCLEI ——To 50 milliliters of a 0.1N sodium carbonate-sodium bicarbonate buffer solution having a pH of 9.95 and containing 2.42 milliequivalents of sodium hypochlorite was added 0.100 g of the resin nucleus compound. Five milliliter samples were taken at intervals and titrated for active chlorine by the iodine-thiosulfate method.

ROOM TEMPERATURE STORAGE STABILITY OF RESIN CHLORAMIDES —— Samples of the standard resin-treated fabrics were chlorinated using 50 g/l of a 5.25% solution of sodium hypochlorite and a 50/1 liquor/cloth ratio for 15 minutes followed by a cold rinse in an automatic washer. The fabrics were air dried and stored under standard conditions of 70°F and 65% relative humidity. Portions of the samples were titrated for retained chlorine daily for four days and once weekly thereafter. The results of this investigation are tabulated in Table XI and are shown graphically in Figure 5 in the "Discussion" section of the paper.

DETERMINATION OF TOTAL AND ACTIVE CHLORINE ON STORED FABRIC——A sample of chlorinated triazone-formaldehyde resin-treated fabric was prepared in the same manner as the fabrics used for the study of the room temperature stability of chloramides. It was stored at 70°F and 65% relative humidity. Portions of the sample were analyzed at intervals for active chlorine by the thiosulfate method. They were analyzed for total chlorine by warming the fabric with dilute hydrogen peroxide to convert any active chlorine to chloride followed by titration with silver nitrate. The sample contained 0.201% total chlorine and 0.090% active chlorine initially but 0.160% total chlorine and 0.035% active chlorine after storage for three weeks.

STABILITY OF RESIN CHLORAMIDES ON HEATING——Approximately 1¼-yard samples of resin-treated fabrics were treated with fifty times their weight of a solution containing 0.25% available chlorine at 80°F for fifteen minutes in large, stainless-steel buckets. The samples were then rinsed by being subjected to one complete laundry cycle in cold water with no detergent in an automatic washer (Bendix Duomatic washer-dryer), which included a nine-minute wash cycle followed by two rinses and three extractions. The samples were air-dried and conditioned for four hours at 65% RH and 70°F.

Nine 10″ × 12″ swatches were cut from the conditioned sample and heated for one minute at nine different temperatures in a forced-convection-system thermostat-controlled oven (Dispatch Model V-7) with the samples hung perpendicular to the flow of air. After being heated, the swatches were conditioned overnight at 65% RH and 70°F. Determination of active chlorine was made by the standard thiosulfate titration procedure.

CHLORINE RETENTION ON GLASS FABRIC——Samples of medium-weight glass fabric and of 80 × 80 cotton print cloth were prepared to contain 6% solids of mela-

TABLE XI
Room temperature storage stability of resin chloramides
Percent retained chlorine

Type resin	Days 0	1	2	3	6	13	20
Untreated	0.0028	0.0028	0.0028	0.0026	0.0020	0.0020	0.0020
DMEU	0.032	0.032	0.030	0.029	0.028	0.024	0.024
UF	0.297	0.290	0.273	0.264	0.250	0.232	0.188
MF	0.182	0.181	0.179	0.178	0.171	0.169	0.160
Triazone	0.115	0.093	0.087	0.074	0.069	0.060	0.050
TADU	0.492	0.480	0.478	0.449	0.445	0.355	— —

mine-formaldehyde or urea-formaldehyde resin. Two percent amine hydrochloric catalyst was used. The samples were cured five minutes at 310°F, afterwashed and dried.

The samples were chlorinated separately by AATCC Tentative Test Method 92-1958. Available chlorine in the fabric was determined after twenty-four hours by the potassium iodide-thiosulfate method. The chlorinating bath initially contained 0.25% active chlorine.

The fabric samples were heated in a test tube for 10 minutes at 365°F, the liberated HCl being collected in water and titrated with 0.02 N NaOH. The fabric itself was then placed in the water, and residual acid titrated.

PREPARATION OF N-CHLOROMELAMINE ——— N-chloromelamine was prepared by the method of W C Arsem (*30*). Analysis: Cl calcd, 22%; found, 18.5%.

DECOMPOSITION OF N-CHLOROMELAMINE———A pyrolysis train was used, consisting of a reactor heated by an electric mantle and a scrubbing tower. Nitrogen gas carried the vapors through the train. The tower was filled with 20% KI solution and with standard NaOH solution in alternate runs.

1.6 grams (10 millimoles) of N-chloromelamine, heated at 215°C, liberated five milliequivalents of iodine in one run, and neutralized 7.0 milliequivalents of NaOH in a second run. All of the chlorine in the sample appeared as chlorine gas. The residue did not liberate iodine from the KI solution. The infra-red spectrum of the residue resembled that of melamine.

When 1.6 grams of N-chloromelamine was mixed with three grams of polyvinyl alcohol and pyrolyzed, the effluent gases did not react with KI or NaOH. The mixture blackened, and a large amount of water condensed in the cool top of the reactor. A third run, with polyvinyl alcohol alone, produced only a very small amount of water. The residues of the first two runs, when steeped in alcoholic KOH, gave a positive chloride ion test.

From the pyrolysis of 1.6 grams of chloromelamine mixed with three grams of methyl cellulose, only a trace of iodine was liberated. The gases neutralized 1.82 meq of NaOH. The residue neutralized 4.9 meq of NaOH, gave a positive chloride ion test, but contained no "active" chlorine.

EFFECT OF CHLORINE ON COTTON EXPOSED TO LIGHT——— Samples of cotton print cloth were placed in separate Pyrex tubes. After evacuation, 25 mg of chlorine gas was admitted to each tube. One tube was then kept in the dark, the other exposed 16 hours at a distance of six inches from a small germicidal lamp. After exposure, the tensile strength of the samples was measured. The exposed sample had lost 100%, the one in the dark only 37%. 1.1-gram samples of the exposed cotton were boiled 30 minutes in water, and pH measured:

	pH
Untreated cotton	7.0
Dark sample	5.5
Light sample	2.2

UNSATURATED INHIBITORS——— The unsaturated methylol derivatives were prepared from acrylamide and N,N-diallymelamine by heating the amide with a slight molar excess of formaldehyde at pH 9.5. The reaction mixture was then neutralized and mixed with commercial resins at a solids ratio of 2/1 resin/inhibitor.

COBALT SALT INHIBITORS——— The salts mentioned in Table IX were applied as follows. Samples of resin-treated fabrics, bleached and unbleached, were dipped in 1% solutions of the appropriate salt. Each sample was blotted and oven-dried 30 minutes at 70°C. The scorching temperatures was reduced to 270°F, to obtain measurable strengths.

ACID NEUTRALIZING POWER OF RESIN TREATMENTS ——— Swatches of the standard resin-treated fabrics were padded at approximately 75% pickup with water and with five different concentrations of hydrochloric acid, dried at room temperature and immediately scorched for 30 seconds a 365°F. The concentrations of the hydrochloric acid solutions were checked by acid-base titration. After scorching, the samples were conditioned at 65% RH and 70°F, and tested for tensile strength by the one-inch strip method. Triplicate measurements were made.

SUMMARY AND CONCLUSIONS

The scientific contribution of this study has been to elucidate the nature and extent of some of the fundamental reactions involved in the chlorine damage phenomenon by the use of chemical techniques both *in vitro* and on fabrics rather than by physical fabric test methods which have been used almost exclusively in studies of this kind heretofore. The use of several original and unique techniques has provided basic information about the chlorine damage phenomenon never before obtained.

The study indicates that chloramide formation probably follows simple equilibrium laws with its extent being dependent only on the number of NH groups in the resin and the equilibrium constant for the chloramide formation reaction for the particular resin. This fundamental reaction in chlorine retention is interfered with by competing oxidative reactions taking place in the chlorination bath. The oxidative reactions appear to take place at any free NH group in the resin molecule and thus to compete directly with and to occur simultaneously to chloramide formation, which also takes place on free NH groups. These oxidative reactions, which are accelerated at increased temperatures, result in disruption of the resin molecule.

The decomposition of resin chloramides varies considerably with the resin type. A suggested mechanism for chloramide decomposition involves dissociation of the chloramide to produce a chlorine radical which then extracts a hydrogen atom from the cellulose substrate to form hydrogen chloride. Chlorine damage can be inhibited by deactivation of the chlorine radical before it can extract a hydrogen atom from the substrate.

Damage to the fabric is due primarily to the action of hydrogen chloride at elevated temperatures rather than to the oxidative attack of the chlorine radical. Resins vary in ability to

neutralize hydrogen chloride with triazone resins having considerable neutralizing power, melamine resins having low neutralizing power, and the other resins studied having almost none.

The real practical contribution of this work has been the development of a sound scientific basis for the whole phenomenon of chlorine damage. This permits the development of more significant tests for chlorine damage, resins with greater resistance to chlorine damage and techniques for the application of resins. This basis has not been available heretofore.

A theoretical basis for the difficulties experienced in the reproducibility of AATCC Tentative Test Method 92-1958 has been pointed out. Because of the many different factors involved in the overall phenomenon of chlorine damage and the different behavior of each resin type towards each factor, any test procedure which departs from end-use procedure in order to arrive at an accelerated test is apt to give distorted results with at least some resins. By isolating and making quantitative measurements of the contribution of a number of these factors, such as the degree of chloramide formation, chloramide stability, and buffering capacity to the overall phenomenon, this study should aid in the development of more reproducible tests and tests showing better correlation with end-use performance.

From the results of this study, a number of ways by which low chlorine damage might be achieved are suggested, some of which have already been used, mostly on an empirical basis, by resin manufacturers and finishers. Some of these ways are:

1) The production and use of resins which will not form large amounts of chloramide on bleaching because the equilibrium of resin amide and hypochlorite with the resin chloramide strongly favors the amide rather than the chloramide.

2) The combination of proper resins and treating conditions so that almost all of the nitrogen atoms in the resin are completely substituted in the cured resin.

3) The discovery and use of resins forming chloramides which are so stable that they are not decomposed at normal ironing temperatures.

4) The use of resins or mixtures of resins and free radical inhibitors which will inhibit the formation of hydrogen chloride by the free radical decomposition of the chloramide and subsequent reaction of the chlorine radical with cellulose to form hydrogen chloride.

5) The use of resins, resin blends, or mixtures of resins with washfast acid-neutralizing materials having enough neutralizing power to neutralize the amount of hydrogen chloride formed from the chlorine retained by the resin or blend.

In addition to providing a basis for work on improved test methods and improved resins having low chlorine damage, this study has pointed out the need for resins which are more resistant to the oxidative attack of hypochlorite bleaches. Additional work is also needed to provide information about resin types not included in this study, about the effect of various resin catalysts on chlorine damage and about the effect of laundering procedures on chlorine retention. The techniques used in the present study should be valuable in such future work. They can also be used to study the drift, or change with storage, of the resistance of fabric treated with a particular resin to chlorine damage. The techniques can perhaps also be used in studying other properties of resin finishes which change with time and which have thus far been elusive. Such a property is the tendency to develop odors under humid storage conditions.

It is the impression of this committee that, rather than offering a completed study, the way has been barely opened for extensive, fruitful scientific and practical studies on resin-treated cotton fabrics, and it is the intention of the Committee to continue its work in this general field for the benefit of the industry.

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(50) Spangler et al, to Dan River Mills, USP 2,690,404 (9/28/54). Mixed melamine and CEU resins.
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(52) M D Hurwitz, to Rohm & Haas Co, USP 2,833,674 (5/6/58). Resins of reduced yellowing and chlorine damage.
(53) T F Cooke et al, *Textile Research J*, 180-90 (1959). Performance characteristics of a new triazine-formaldehyde based crosslinking agent for cellulosic fabrics.

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(59) J D Reid et al, *Textile Research J 27*, 252-9 (1957). Studies on permanent creasing of cotton garments.
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(61) L W Mazzeno Jr et al, *ibid 47*, 609-13 (1958). Effect of commercial laundering on CEU-treated cotton fabrics.
(62) J G Frick Jr et al, *Textile Research J 29*, 314-22 (1959). Chemical and physical effects of finishing cotton with methylol derivatives of ethyleneura.
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Membership Applications

October 13-19, 1960

NEW ENGLAND REGION

Northern New England Section

Senior

Eli Heimberg — Vice president, Cameo Curtains, New Bedford, Mass. Sponsors: M J Green, D E York.

Jim Marsden—Colorist, Hampton Mills Inc, Northampton, Mass. Sponsors: R Thorton, C A Robinson.

CENTRAL ATLANTIC REGION

Metropolitan Section

Senior

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Raymond L Sweet—Demonstrator, Sandoz, Inc, New York, NY. Sponsors: J F Soteriou, L F Vossel.

Waldo Trescott — Technical dir, Best Dyeing & Finishing Co, Elizabeth, NJ. Sponsors: L K McChesney, M M Guertin.

Delaware Valley Section

Associate

J Bertram Bates—Staff chemist, HRB-Singer Inc, State College, Pa.

Transfer to Senior

William H Brehm II—Partner, Brehm & Stehle Dye Works, Philadelphia, Pa. Sponsors: E Empting, A E Raimo.

SOUTHERN REGION

Piedmont Section

Senior

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George L Brodmann — Textile chemist, Carbic-Hoechst Corp, Charlotte, NC. Sponsors: E H Grayson, W H Jones.

Lawrence T Carter—Supt, Kayser-Roth Hosiery Co Inc, Ladies' Finishing Div, Concord, NC. Sponsors: C M Spoon, T H Pike.

Ross R Fowler—Asst supt finishing, Kendall Mills, Bethune, SC. Sponsors: R Kennette, J H O'Neil.

Winfrey T Martin Jr—Lab work, Kayser-Roth Corp, Burlington, NC. Sponsors: C M Spoon, T H Pike.

Edward B Wrike—Dyer, Jamestown Mills Inc, Jamestown, NC. Sponsors: W C Parker, D B Norton.

Junior

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Francis C Mackey Jr—Lab sample dyer, J P Stevens Co Inc, Delta Plant #2, Wallace, SC. Sponsors: H G Parrish, J T Crawford Jr.

William G Newsome Jr—Chemist, Burlington Industries Inc, Greensboro, NC. Sponsors: C J Graham, R H Palmer.

Washington Section

Senior

S Helen Roberts—Textile physicist, USDA, Washington, DC. Sponsors: M S Furry, A E Davis.

Transfer to Senior

Doris I Lyerly—Textile technologist, Harris Research Labs Inc, Washington, DC. Sponsors: J F Krasny, H E Harris.

Junior

Mary L Walsh—Textile specialist, Agricultural Res Service, USDA, Beltsville, Md. Sponsors: M S Furry, F H Forziati.

Southeastern Section

Senior

George C Daul—Senior chemist, research, Courtaulds Inc, Mobile, Ala. Sponsors: C B Ray, A B Hilton.

Terrence W Fenner—Asst chemist, Southern Regional Res Lab, US Dept of Agriculture, New Orleans, La. Sponsors: R M Reinhardt, R M A Kullman.

F M Wallace—Asst southern mgr, Keever Starch Co, Columbus, O. Sponsors: G P Paine, G M Kidder.

Associate

Lawrence O Bublitz—Technical dir, Deltox Rug Co, Div Armstrong Cork Co, Oshkosh, Wis.

STUDENT CHAPTERS

Bradford Durfee College of Technology

George E Quigley—Student, Bradford Durfee College of Technology, Fall River, Mass. Sponsor: C E Medde.

Clemson College

John B Neely Jr—Student, Clemson College, Clemson, SC. Sponsor: J Lindsay.

NOT AFFILIATED WITH A SECTION

Associate

Miura Hatsuo—Chief of sample section, Marubeni-Iida Co Ltd, Osaka, Japan.

October 20-26, 1960

NEW ENGLAND REGION

Northern New England Section

Senior

George Blyth Jr—Overseer of dyeing, J P Stevens Co Inc, Andover, Mass. Sponsors: R A McGurren, A E Guidotti.

Student

Albert Meilink—Trainee, Chicopee Mfg Corp, Chicopee Falls, Mass.

Western New England Section

Senior

Francis P Tolka—Finisher, Bachmann Uxbridge Wstd, Uxbridge, Mass. Sponsors: E E Tabor, H J Barnett.

Anthony Mauerer—Chemist, Stafford Printers Inc, Stafford Springs, Conn. Sponsors: H A Stauderman, J E Conway.

CENTRAL ATLANTIC REGION

Metropolitan Section

Senior

Charles B Beiter—Microbiologist, Metal & Thermit Corp, Rahway, NJ. Sponsors: A E Raimo, E Empting.

Giorgio Binda—Chemist, Chemoie Corp, New York, NY. Sponsors: G M Kidder, G J Mandikos.

Martin Blakeman—Mgr, licensing programs, Celanese Fibers Co, New York, NY. Sponsors: C A Whitehead, S C Ruffenach.

Roger A Calsibet—Asst mgr, new prod mkt dev, Union Carbide Plastic Co, New York, NY. Sponsors: A E Raimo, E Empting.

Raymond J Fallon—Product mgr (bactericides fungicides), Metalsalts Corp, Hawthorne, NJ. Sponsors: R P Monsaert Jr, J E Conway.

Frank H Foxlee—New product engr, Union Carbide Plastic Co, New York, NY. Sponsors: A J Kellner, A F Tesi.

Charles A Meier—Chemist & purch agent, Cliffside Dyeing Corp, Paterson, NJ. Sponsors: J G Ferguson, A E Raimo.

Joseph A Ramp—Chief, microbiology lab, Metalsalts Corp, Hawthorne. NJ. Sponsors: J E Conway, H A Stauderman.

John E Sherman — Salesman, Grestco Dyes & Chemicals, Brooklyn, NY. Sponsors: A E Raimo, M Bartholomew.

Stanley S Slowata — Chemist, American Cyanamid Co, Bound Brook, NJ. Sponsors: I Von, C E Zortman.

Gunter Thiel—Textile chemist, Verona Dyestuffs, Union, NJ. Sponsors: E Empting, A E Raimo.

Abraham R Young—Sales mgr, Fabric Finishing Co, New York, NY. Sponsors: J J O'Neil Jr, A G Kneeland.

Associate

Harold W Rose Jr—Sales, Alliance Chem Corp, Newark, NJ.

Jack H Lilburn—Market dev, Texas Butadiene & Chem Corp, New York, NY.

John V Lyons—Tech serv rep, Food Mach & Chem Corp, Princeton, NJ.

Junior

Peter Van Vlaanderen—Sales & service, Van Vlaanderen Machine Co, Paterson, NJ. Sponsors: G M Kidder, G J Mandikos.

Ed J C M Van Wely—Student (trainee), American Cyanamid Co, Bound Brook, NJ.

Hudson-Mohawk Section

Senior

Marcel J Touponse Jr—Mgr, Beacon Piece Dye Finishing Co, Beacon, NY. Sponsors: A E Raimo, M Bartholomew.

Delaware Valley Section

Senior

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Samuel L Cassedy—Sales rep, Becco Chemical Div, Food Mach & Chem Corp, Philadelphia, Pa. Sponsors: J E Conway, P J Luck.

Jack J Cram—President, Concord Chemical Co Inc, Camden, NJ. Sponsors: A E Raimo, J J O'Neil Jr.

Miles B Dahlen—Technical service rep, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: J G Kelley, J E Conway.

Norman G Diggins—Dyer, American Viscose Corp, Marcus Hook, Pa. Sponsors: I H Welch Jr, A E Raimo.

Frank J Grano—Textile tech service, Food Machinery & Chem Corp, Princeton, NJ. Sponsors: A E Raimo, C Zortman.

Charles E Harrison—Lab supv, American Viscose Corp, Marcus Hook, Pa. Sponsors: W S Sollenberger, A E Raimo.

Donald M Jones—Supt of dyeing, Blue Ridge Textile Co Inc, Bangor, Pa. Sponsors: J E Conway, R Correll.

Milton C Keen—Colorist, E I duPont de Nemours & Co, Inc, tech lab, Wilmington, Del. Sponsors: O S Larson, B F Quigley.

Paul W Saylor—Chemist, E I duPont de Nemours & Co, Inc, textile res lab, Wilmington, Del. Sponsors: J Kennedy, J W Lynch.

Edward F Silk—Gen mgr, Dorman Mills, Parson, W Va. Sponsors: J A Kelly, W D Humphreys.

Matthew F Tarde—Asst dyer, Continental Dye Co, Philadelphia, Pa. Sponsors: A E Raimo, J E Conway.

Alden R Taylor Jr—Tech service rep, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: J M McFarlane, H A Stauderman.

Walter W Thomas — Research chemist, Hercules Powder Co, Wilmington, Del. Sponsors: J E Conway, H A Stauderman.

Philip Wehner — Chemist, Toms River Chem Corp, Toms River, NJ. Sponsors: E J Finan, H A Stauderman.

Associate

Donald S Renshaw—Tech dev, Hercules Powder Co, Inc, Wilmington, Del.

SOUTHERN REGION

Piedmont Section

Senior

Ervin Bolgar—Chemist, Templon Spinning Mills, Mooresville, NC. Sponsors: J E Conway, H A Stauderman.

Lloyd E Franklin Jr—Sales & dev, Air Reduction Chem Co, New York, NY. Sponsors: H A Rutherford, H Y Jennings.

George L Payet—Supv textile lab, Columbia Southern Chem Co, Div Pittsburgh Plate Glass Co, Barberton, O. Sponsors: R R Currier, R D Monsaert Jr.

James M Perry—Head finisher, Stonecutter Mills Corp, Spindale, NC. Sponsors: L Jacobs, J A Ramsay.

Joachim C Roehl—Textile finisher, A Monforts Maschinenfabrik, Germany. Sponsors: F Fortess, H A Stauderman.

Southeastern Section

Senior

John S Moore—Chemical engr, Vanity Fair Mills, Monroeville, Ala. Sponsors: H A Stauderman, E J Finan.

WESTERN REGION

Mid-West Section

Senior

Faber B Jones—Print chemist, Battelle Memorial Inst, Columbus, O. Sponsors: J J O'Neil Jr, G M Kidder.

Mary Lapitsky—Asst prof, textile & clothing, Ohio State Univ, Columbus, O. Sponsors: A E Raimo, E Empting.

Robert I Leininger—Chief, polymer research, Battelle Memorial Inst, Columbus, O. Sponsors: J J O'Neil Jr, G M Kidder.

Alma F Tapscott—Asst prof, Ohio State Univ, Columbus, O. Sponsors: A E Raimo, E Empting.

Junior

John L Steen—Textile fibers salesman, Dow Chem Co, Detroit, Mich. Sponsors: F M Raqicz, C R Sheehan.

NOT AFFILIATED WITH A SECTION

Senior

Alfredo Behrens—Head, technical div, Bancroft Brillotex International SA, Montevideo, Uruguay. Sponsors: R C Squier, G A Billingsley.

Metropolitan Section———

DYEING AND FINISHING BLENDS OF WOOL AND DYNEL*

F C RIPPNER
Union Carbide Chemicals Co
Division of Union Carbide Corp
New York, NY

SOME time ago a manufacturer of woolen fabrics told us he found that an excellent washable fabric very much like an all-wool cloth could be had by blending seventy parts of wool with thirty parts of Dynel. According to his statement, such a blend would eliminate many of the shortcomings of an all-wool cloth. The Dynel modacrylic in the blend would prevent felting and still maintain a desirable hand.

His concern was whether we knew how to dye good unions and perhaps cross effects on such a blend.

The Textile Fibers Laboratories of Union Carbide Chemicals Co had been working on this problem. We had had very good results in the laboratory; but when we tried to apply our knowledge in the field, we had always encountered difficulties of one kind or another. We didn't have a real opportunity to work out the problems because perfect results were usually expected at the first try. A mill might have a piece of fabric on which they desired some difficult shade. Very often the equipment wasn't proper or the time was not available. Occasionally, we were successful, but the process required up to ten hours and the mill personnel felt that they could not afford to spend so much time on the dyeing.

Based on this experience, we told this manufacturer quite frankly that, if he were willing to let us work out all the problems, we might be able to come up with a practical procedure. He agreed and a few weeks later a trip was arranged to one of his plants. A bright red shade was selected by mill personnel for the first piece and it was explained that, if we could dye this shade, we should be able to dye any. We took our time in doing the job. We carefully neutralized the fabric, and, after ten hours, came up with a result that was by no means perfect—even though the dyeing was level, the Dynel was too bright and too light. Surprisingly however, the mill personnel, who had had such bad previous experiences with other blends, became rather optimistic and encouraged us to make further trials.

Some fifty pieces were woven and we were told not to hesitate to run experiments because a few spoiled pieces could be tolerated. The main objectives were to get a better union and a much shorter dyeing cycle.

The next experiment involved the same bright red shade with the goal of improving union. The formula called for milling dyes for the wool and cationic dyes for the Dynel. To get a better union, we had to increase the amount of cationic dyestuffs. At this point, we ran into real trouble. The large amounts of cationic dyes precipitated in the presence of acid dyes. A way had to be found to overcome this difficulty. The solution was discovered in a product, Peregal TW, well known for its emulsifying properties. The next experiment was successful and yielded a bright red shade with good fastness properties. However, the dyeing still took some ten hours. Milling dyes had to be used to get washability, and therefore, a very thorough neutralizing of the carbonized fabric had been necessary. In addition, the temperature of the bath had to be brought up very slowly and each time an "add" was made, the bath had to be cooled to 160°, the dyestuff added very slowly, the bath brought back to boil again over twenty to thirty minutes. Additions of acid had to be made very carefully, too. All this, as you know, is extremely time-consuming.

About this time, a new product, Tinegal RWI, was called to our attention. This chemical was alleged to have excellent leveling properties for milling and neutral-dyeing premetalized dyes in an acid bath. An experiment was made that was considered to be very bold at that time. The carbonized fabric was not neutralized, it was just given a light wash at 140°F. The dyebath containing this new chemical was brought from 100° F to a boil in less than 30 minutes. "Adds" were made between 180° and 190°F.

The result was excellent. The piece dyed this way was perfectly level from end to end and from side to center. The dyeing time was cut practically in half. This method was adopted. About fifteen different shades were dyed in three-piece lots. The formula seems to be somewhat involved and is probably subject to simplification. For obvious reasons, however, we were not too anxious to make major changes in procedure at this stage of the program.

Two of the formulas are given in Tables I and II.

The products mentioned are the ones used, but there may be competitive chemicals on the market fully capable of doing the job. We have not had the opportunity to try all the possibilities on a large scale as yet, and laboratory findings are not necessarily conclusive. Unexpected difficulties may arise and to illustrate I would like to give you an example of a possible mishap. The dyer in the mill where we were working was very much interested in our method of handling carbonized fabric that was not neutralized. As an experiment, he tried the same method using a different chemical. While we had found that this chemical performed very well in the laboratory, it foamed excessively in the dye tub and caused the pieces to tangle. Experiences like this make anyone cautious about changing procedures arbitrarily.

The best procedure is to set up the dyebath at 100°F adding the chemicals

TABLE I
Royal blue

2.00%	Tinegal RWI
2.00%	Peregal TW
6.00%	Cindye AC-9
1.50%	Duponol G
0.45%	CI Acid Blue 90
0.12%	CI Acid Blue 80 50%
0.02%	CI Acid Violet 48
3.25%	Maxilon Blue RLA
0.05%	Maxilon Red BL

TABLE II
Scarlet

2.00%	Tinegal RWI
2.00%	Peregal TW
6.00%	Cindye AC-9
1.50%	Duponol G
2.00%	Acid Light Scarlet BL
0.45%	CI Aid Red 133
1.05%	Sevron Brilliant Red B
0.40%	Maxilon Red BL
1.50%	Deorlene Brilliant Yellow 5GL

*Presented before the Metropolitan Section October 21, 1960 at Kohler's Swiss Chalet, Rochelle Park, NJ

one by one. The Tinegal and the Peregal can be freely added to the dyebath. The Duponol G should be dissolved in a small amount of very hot water and the carrier added to this solution while stirring. This forms a milky suspension which should be added to the dyebath with due care not to splash it on the fabric. We found that the carrier will do a much better job in the presence of Duponol G.

After the chemicals are added, the fabric should be run for about ten minutes. After this, the milling dyes are added, and the dyebath brought to 170°F in about twenty minutes. At this stage the cationic dyes, dissolved with a small amount of acetic acid, are added to the bath, the temperature is brought to a boil in fifteen to twenty minutes, and boiling is continued for thirty to forty-five minutes. Closed equipment is preferable. If the addition of acid is necessary, the doors should be opened for the dyebath to cool back to about 190°F. The same precaution should be taken when adding dyestuffs. Milling dyes and cationic dyes can be added at the same time, but they should be dissolved separately. If the "adds" are rather heavy, five minutes should elapse between the addition of the two dyestuff groups.

When the dyeing is finished, the fabric should be cooled back slowly in order to avoid wrinkles. On very full shades an afterscour at 140°F is recommended to get the best possible washfastness. The scour should contain about 1% of a good nonionic detergent and 2% of acetic acid 56%.

For shades that can be achieved by the use of neutral-dyeing premetalized dyes, a simplification of the procedure has been worked out. Two formulas are given in Tables III and IV.

TABLE III
Medium brown

2.00%	Tinegal RWI
2.00%	Peregal TW
6.00%	Carrier AC-9
1.50%	Duponol G
3.00%	Diammonium phosphate
0.75%	Ammonia
0.17%	Cibalan Grey GLS
0.15%	CI Acid Red 220
0.75%	CI Acid Orange 85
0.70%	CI Acid Brown 46

TABLE IV
Navy

2.00%	Tinegal RWI
2.00%	Peregal TW
6.00%	Carrier AC-9
1.50%	Duponol G
3.00%	Diammonium phosphate
0.75%	Ammonia
2.40%	CI Acid Blue 165
0.60%	CI Acid Red 182
0.90%	Xylene Milling Navy 4B Add
1.20%	Acetic acid 56%

The same chemicals are used, but an addition of 2 to 3% diammonium phosphate will be necessary. Selected neutral-dyeing premetalized dyestuffs will dye a near union on the two fibbers when using this method. It is preferable to select those dyestuffs that will dye both fibers the same depth or will yield a slightly heavier shade on the Dynel. The shade difference can then be adjusted with the addition of milling dyes. Most members of this group will dye the wool without changing the shade of the Dynel. If an adjustment of the shade of the Dynel is necessary, small amounts of cationic dyes can be used. However, some neutral-dyeing premetalized dyestuffs will tolerate only small amounts of cationic dyestuffs and therefore discretion should be used.

Most of the neutral-dyeing premetalized dyes will exhaust well, and after-scour can be omitted. Here again experience will dictate the best possible approach. If an after-scour is found necessary, an anionic detergent and tetrasodium pyrophosphate should be used at 140°F.

People who have handled Dynel are aware of the fact that the fiber delusters during dyeing. In order to reluster it, heat has to be applied. Recommended temperatures for the 70-30 wool blends are around 275°F. In the dyehouse, when the dyer looks at his samples, he should make sure that his hand patches are subjected to about the same temperaure as the finisher will apply on the dryer. We have found that the easiest way to do this is to cover a steam pipe with a single layer of cotton cloth and press the sample patches against it.

Just a few words about finishing this fabric. As in the handling of any washable wool cloths, minimum tension should be used for this blend in order to obtain the maximum amount of relaxation. As mentioned, the fabric must be exposed to heat in order to reluster the Dynel. This is done during the normal drying operation. This heat treatment enables the Dynel to stabilize the wool and is an important factor in obtaining fabrics with optimum dimensional stability.

At this time, may we express our thanks to our many friends, and especially to the Geigy organization for the assistance extended to us in solving many problems connected with this project.

AATCC Calendar

COUNCIL, COUNCIL COMMITTEES, RESEARCH COMMITTES

Nov 17-18 (Sheraton-Atlantic Hotel, New York, NY); Nov 17—Council Committees and Research Committees; Nov 18 (AM)—ECR, TCR; Nov 18 (PM)—Council and Annual Meeting

Jan 19-20 (Sheraton-Atlantic Hotel, New York, NY); Jan 19—Council Committees and Research Committees; Jan 20 (AM)—ECR, TCR; Jan 20 (PM)—Council

NATIONAL CONVENTIONS

Sept 27-29, 1961 (Hotel Statler, Buffalo, NY); 1962 (Atlanta Biltmore Hotel, Atlanta, Ga); 1963—Boston; 1964—New York; 1965 (Conrad Hilton Hotel, Chicago, Ill)

DELAWARE VALLEY SECTION

Dec 9 (Philadelphia, Pa)

HUDSON-MOHAWK SECTION

Nov 18 (Chelsea House, Tribes Hill, NY); Jan 13 (Jack's Restaurant, Albany, NY—paper on Nonwoven Fabrics); Mar 10 (Johnstown, NY—paper on "Wash-and-Wear" Fabrics); Apr 14 (Waterford, NY—plant tour of General Electric Co's Silicone Div); May 12 (Ladies Night); June 23 (Outing—Antlers Club, Amsterdam, NY)

METROPOLITAN SECTION

Nov 18 (Kohler's Swiss Chalet, Rochelle Park, NJ—"Importance of L-22 to Converter and Finisher"—Ephraim Freedman, Macy's Bureau of Standards); Jan 20 (Hotel New Yorker, New York, NY—"AATCC Goals"—Ernest R Kaswell, Fabric Research Laboratories, Inc); Feb 17 (Hotel New Yorker, New York, NY—"New Developments in Dye Assistants"—speaker from the DuPont Co); Mar 24 (Kohler's Swiss Chalet, Rochelle Park, NJ—"Polyolefins—speaker from AviSun Corp); April 21 (Kohler's Swiss Chalet, Rochelle Park, NJ—"Importance of Bow and Skew"—Lucille Rea, Simplicity Patterns, and John Robertson, Mt Hope Machine Co); May 19 (Kohler's Swiss Chalet, Rochelle Park, NJ—Ladies Night, "Detergents for Home and Mill"—Dr & Mrs Foster D Snell, Foster D Snell, Inc (tentative)

NIAGARA FRONTIER SECTION

Apr 7 (Joint meeting with Ontario Section, CATCC, St Catherines, Ont); May 18 (Buffalo, NY)

NORTHERN NEW ENGLAND SECTION

Dec 9 (Colonial Country Club, Lynnfield, Mass—"Present-day Economic Outlook in Textiles"—William I Kent, Kent Mfg Co); Jan 20 (Hotel 128, Dedham, Mass—Symposium on "Mechanical and Chemical Finishing of Textile Fabrics"—John J MacDonald, Lowell Technological Inst; D D Gagliardi, Gagliardi Research Corp; and Werner von Bergen, J P Stevens & Co, Inc)

PACIFIC SOUTHWEST SECTION

Nov 18 (Rodger Young Auditorium, Los Angeles, Calif); Dec 10 (dance)

PIEDMONT SECTION

Jan 21 (Poinsett Hotel, Greenville, SC); April 2 (Washington Duke Hotel, Durham, NC); June 9-10, 1961 (Outing—Grove Park Inn, Asheville, NC); Sept 23, 1961 (Hotel Charlotte, Charlotte, NC)

RHODE ISLAND SECTION

Dec 2 (Annual Meeting—Johnson's Hummocks)

SOUTH CENTRAL SECTION

Dec 9 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION

Dec 3 (Atlanta Athletic Club, Atlanta, Ga)

WESTERN NEW ENGLAND SECTION

Dec 2 (Rapp's Restaurant, Shelton, Conn)

COUNCIL HIGHLIGHTS

220th Meeting • September 9, 1960 • Atlanta-Biltmore Hotel, Atlanta, Ga

ACCEPTING the invitation of the Southeastern Section to meet in Atlanta, Council met for its 220th session on Friday afternoon, September 9, 1960, with President Weldon G Helmus presiding.

* * *

Because of the opposition to the recommendation of the Study Committee on Long-Range Objectives that AATCC participate in the development and endorsement of standards of performance, the Executive Committee, after much deliberation, has concluded that it would be inadvisable to pursue the subject further. The Executive Committee has decided to table the recommendation.

* * *

Another recommendation of the Study Committee, ie, rewriting AATCC's constitutional objectives, was considered by a subcommittee of the Executive Committee headed by W George Parks, vice president (New England Region). It was the view of the subcommittee that the Association's objects as presently written are sufficiently broad to cover any activities contemplated in the immediate future. Hence, this recommendation was also tabled by the Executive Committee.

* * *

Council has approved the appointment of A H Gaede to represent AATCC on Committee CS11-41, Moisture Regain in Cotton Yarns, of the Commodity Standards Division of the Department of Commerce.

Inasmuch as Ruby K Worner is spending the next year in Egypt on a Fulbright grant, Council has approved the appointment of G A Slowinske, chairman of the AATCC Committee on Water Resistance to Fabrics, to replace Dr Worner as AATCC's representative on Working Group No. 1 of ISO TC/38 on Waterproofness Testing.

* * *

A proposal to the Executive Committee that seminars be organized under AATCC sponsorship has been referred to the Executive Committee on Research for suggestions as to how seminars might be organized and conducted.

* * *

A subcommittee of the Executive Committee, consisting of C A Sylvester, chairman, and A H Gaede and W S Sollenberger as members, has been organized to review a report submitted by the Study Committee on the Intersectional Contest. The report, dealing with the future of the Contest, was praised by President Helmus as a fine piece of work, and because of its importance and length, the subcommittee has been named to review it further.

* * *

Reporting for the Committee on Conventions, Elliott Morrill, chairman, reported that the "Operating Manual for AATCC Conventions", which had been prepared by the executive secretary, was in its second draft and had been circulated among the members of the Committees to the 1961 and 1962 Convention Committee chairmen. He stated that the manual would be worked over by Convention operating committees before it was put into final form.

The 1961 Convention Committee has met in Buffalo, NY to discuss plans for next year's three-day meeting in that city. The 1962 Convention at Buffalo, including the prize scholarships under the same rules and procedures as previously approved. Provision for the two $500 scholarships had been made in the current budget.

* * *

In his financial report, Executive Secretary George P Paine noted that receipts from individual members showed an increase of $2,365.69 over the previous fiscal year at July 31, 1960. Corporate Membership dues had fallen off by $574.75 and Sustaining Memberships by $50, but sales of technical supplies had increased $1,650.50 and royalties received by $1,312.76.

Mr Paine stated that sales of the *Colour Index* have amounted to about $11,000 and that the Association is approximately $7,000 in the black from this activity. Mr Paine feels that a continued demand for the *Colour Index* is to be anticipated. particularly in view of the adoption by the U S Bureau of Customs and the Tariff Commission of the *Colour Index* references.

* * *

The pension plan for AATCC employees was formalized on June 8, 1960 when a representative of the underwriting company met with the headquarters staff to go over details and acquaint the employees with the provisions of the plan. The staff has expressed its appreciation to the Council.

* * *

Council has authorized the treasurer to purchase short-term U S Government bonds, treasury bills, notes and certificates with maturing dates of less than one year from the date of purchase. Council also approved the transfer of $30,000 from the cash account for reinvestment by the Appropriations Committee.

* * *

In connection with a revision of Part V of the *Technical Manual,* Council has approved the appropriation of $3,500 requested by the Publications Committee to meet expenses. It is planned to add to Part V an additional list of textile chemical specialties, arranged by manufacture, and alphabetically under each manufacturer, with the use and chemical nature indicated. There will be an alphabetical list of products and a list of use classifications as previously published. It was noted that about 175 of the 250 companies appearing in the textile chemical specialties list were not Corporate Members of AATCC, but is is felt that the contemplated improvements in the listings may encourage nonmember companies to become Corporate Members.

* * *

The 221st meeting of the Council and the Annual Meeting will be held this Friday, November 18, at the Sheraton-Atlantic Hotel, New York, NY.

'60 CONVENTION REGISTRATION SECOND LARGEST

REGISTRATION at last month's AATCC National Convention fell only 14 short of allowing the sponsoring Delaware Valley Section to boast "1960 in 1960". However, the total registration of 1946 is believed to be the second highest registration in AATCC Convention annals.

The 1960 Convention—AATCC's thirty-ninth—was the first held in Philadelphia since 1937. Under the sponsorship of the erstwhile Philadelphia Section, AATCC Conventions were held in 1944, 1949, and 1955 in Atlantic City, NJ, but additional hotel facilities, including the new Sheraton, which served as the headquarters hotel, prompted the Section to return to the Quaker City this year.

Five technical sessions, an extensive exhibition, the second annual Awards Luncheon, a full Ladies Program, and the Annual Banquet constituted the heart of the program, with a closed-circuit television program serving as the chief innovation.

Fred V Traut, Globe Dye Works Co, and William H Bertolet III, Laurel Soap Mfg Co, Inc, chairman and cochairman respectively, headed the Convention Executive Committee, which included the following subcommittee chairmen: S Graeme Turnbull Jr, E I duPont de Nemours & Co, Inc, technical program; Clarence A Seibert, Scholler Bros, Inc, printing; A E Raimo, John Campbell & Co, and Ernst W Empting, Verona Dyestuffs, registration; Walter W Gleadall, Textile Chemical Co, entertainment; M H Klein, Sandoz, Inc, exhibits; Donald W Robinson, Para-Chem, Inc, finance; L Kevin McChesney, Leatex Chemical Co, publicity; Charles N Kuzma Jr, Amalgamated Chemical Corp, reservations; Joseph J Murphy, Laurel Soap Mfg Co, Inc, dining; and William H Brehm II, Brehm & Stehle Dye Works, transportation.

Ribbon-cutting ceremonies mark official opening of exhibits—(l to r): George P Paine, executive secretary; M H Klein, Sandoz, Inc, chairman, Exhibits Committee; Weldon G Helmus, president; Wm H Bartolet III, Laurel Soap Mfg Co, convention cochairman; Fred V Traut, Globe Dye Works Co, convention chairman.

Attendance at the various technical sessions was especially good, with the initial session on Thursday morning, October 6, running better than 500.

Burt F Faris, E I duPont de Nemours & Co, Inc, served as chairman of the Thursday morning session, which featured a symposium on "Dyeing and Finishing of New Cellulosic Fibers" and three additional papers. Walter J Hamburger, Fabric Research Laboratories, Inc, served as moderator of the symposium. Panelists were L R Graybeal, American Enka Corp, for Enka Fiber 500; C Eugene Coke, Hartford Fibres Co, for Zantrel Polynosic staple fiber; R S Kenyon, Courtaulds (Alabama) Inc, for Corval and Topel, two new cross-linked staples, and Moynel, a high wet modulus fiber; and I H Welch, American Viscose Corp, for Avron, a new high-strength rayon, Avril, a new high wet modulus fiber, and Avlin, a multicellular rayon. Other papers presented on Thursday morning were as follows: "Construction Limits of Fabrics Containing Creslan Acrylic Fiber" by H C Haller, American Cyanamid Corp, and J F Bogdan and Henry K C Woo, North Carolina State College; "The Monforts Reactor —A Versatile Continuous Dyeing Machine for Synthetic Fiber Fabrics" by F Fortess, J E Torbet, G C Ward, and J S Warner, Celanese Fibers Co; and "Dyeing and Finishing of Man-made Fibers in a Cotton Finishing Plant" by Heyward V Simpson, Reeves Bros, Inc.

An Awards Luncheon, at which the Olney Medal, Harold C Chapin, and American Dyestuff Reporter Awards were made at a single luncheon session, was again held this year, after the same arrangement had met with unusual success at Washington last year. A record turnout was on hand at Thursday noon as the 1960 Olney Medal was awarded to Arnold M Sookne, Harris Research Laboratories, Inc; the Harold C Chapin Award to Leonard S Little, consultant; and the American Dyestuff Reporter Award to Victor S Salvin and John R Adams Jr of Celanese Fibers Co and Ruth A Walker of Hunter College. The Proceedings of the 1960 Awards Luncheon will be published in the November 28 issue.

At the Thursday afternoon session,

View of registration desk—A E Raimo, John Campbell & Co, chairman of the Registration Committee, seen at far left.

Panel—Symposium on "Dyeing and Finishing of New Cellulosic Fibers"—(L to r): R S Kenyon, Courtaulds (Alabama) Inc; Walter J Hamburger, Fabric Research Laboratories, moderator; L R Graybeal, American Enka Corp; I H Welch, American Viscose Corp; C Eugene Coke, Hartford Fibres Co; Burt F Faris, E I duPont de Nemours & Co, Inc, chairman

Head table at Awards Luncheon during presentation of Harold C Chapin Award—(l to r): A Henry Gaede, vice president, Southern Region, who made the American Dyestuff Reporter Award presentation; John R Adams Jr, Celanese Fibers Co, 1960 ADR Award winner; Victor S Salvin, Celanese Fibers Co, 1960 ADR Award winner; Mrs Salvin; Mrs Arnold M Sookne; Arnold M Sookne, Harris Research Laboratories, 1960 Olney Medal Winner; Weldon G Helmus, president; Donald W Robinson, Para-Chem, Inc, chairman, Harold C Chapin Award Committee; Leonard S Little, 1960 Harold C Chapin Award winner; William H Bertolet III, Laurel Soap Mfg Co, presiding; Mrs Little; Ruth A Walker, Hunter College, 1960 ADR Award winner; Arthur H Thompson, Ciba Co, Inc, treasurer; Myron D Reeser, Howes Publishing Co, Inc; George P Paine, executive secretary

Arnold M Sookne (left), Harris Research Laboratories, receives 1960 Olney Medal from President Helmus

President Weldon G Helmus (second left) congratulate American Dyestuff Reporter Award winners John R Adams Jr, Celanese Fibers Co (left); Ruth A Walker, Hunter College; and Victor S Salvin, Celanese Fibers Co

Leonard S Little (right) receives 1960 Harold C Chapin Award from President Helmus

Previous Olney Medal winners at the 1960 Awards Luncheon—(L to r): Walter J Hamburger (1956), Emery I Valko (1959), Henry E Millson (1958), P J Wood (1957), Milton Harris (1945), Miles A Dahlen (1955), William D Appel (1954), and Werner von Bergen (1952).

1960 American Dyestuff Award recipients John R Adams Jr (left), Ruth A Walker (third from left), and Victor S Salvin (fourth from left) are shown with AATCC President Helmus (second left). Also in photo are Mrs Salvin and George P Paine, executive secretary.

A portion of the Friday morning technical session panel—(l to r): Raymond S Babiarz, Joseph Bancroft & Sons Co, presiding; Breckinridge K Tremaine, Rhodia, Inc; James E Greer, Burlington Industries Inc; Fred H Steiger, Rohm & Haas Co

A portion of the Saturday morning technical session panel—(l to r): William S Sollenberger, Amercan Viscose Corp, presiding; Robert J Fortune, Tennessee Eastman Co; Irene Blunt; Frank J Rizzo Quartermaster Research & Development Command; M M Christie, E I duPont de Nemours & Co, Inc

Miss Irene Blunt, guest speaker at Annual Banquet

1960 INTERSECTIONAL CONTEST—Speakers, seated, l to r: Bennett S Gesmer, Dyecraftsmen, Inc, Northern New England Section; Rosser L Wayland Jr, Dan River Mills; James H Cox, Auburn Univ, Southeastern Section; George C Kantner, Rohm & Haas Co, Delaware Valley Section; Edward N Alexander, Crown Chemical Co, Rhode Island Section. Standing are A Henry Gaede (left), Laurel Soap Mfg Co, master of ceremonies, and Thomas J Gillick Jr, American Felt Co, Intersectional Contest chairman

Arnold M Sookne presented the 1960 Olney Medalist address, entitled "Improved Textile Properties from New Chemical Structures".

Immediately thereafter, the audience was treated to a presentation entitled "Science and Craft in Color", a color television presentation emanating from Philadelphia Textile Institute on Ciba Eidophor closed-circuit TV, with J Lawrence Hallett Jr, Jeffries Processors, Inc, serving as chairman. Participants in the unusual presentation were Arthur Linksz, attending surgeon, Manhattan Eye and Ear Hospital, and associate professor, NYU Postgraduate School of Medicine, who spoke on "The Physiological Aspects of Color"; Herman R Branson, professor of physics and department head, Howard Univ, on "The Physical Aspects of Color"; and Jacques E Wegmann, Toms River Chemical Corp, on "The Chemical Aspects of Color".

On Friday morning, October 7, Raymond S Babiarz, Joseph Bancroft & Sons, Inc, served as chairman of a session which featured the following six papers: "Acrilan, Acrilan 16, and Their Blends" by Walter Stump, The Chemstrand Corp; "Modern Continuous Dyeing Processes" by Richard Kern, Sandoz Ltd; "Rovana—A Versatile New Yarn" by Charles R Sheehan, Dow Chemical Co; "Reducing the Felting Shrinkage of Wool" by Fred H Steiger, Rohm & Haas Co; "Fabric Development of Synthetic Blends from a Practical Dyer's Viewpoint" by James E Greer, Burlington Industries, Inc; and "The Importance of Odor Control in the Textile Industry" by Breckinridge K Tremaine, Rhodia, Inc.

The Association's 21st annual Intersectional Contest was held on Friday afternoon with five Sections offering papers. Thomas J Gillick Jr, American Felt Co, once again served as chairman, with A Henry Gaede, Laurel Soap Mfg Co, presiding. Entries included the Piedmont Section's "Chemical Mechanisms in Chlorine Retention by Resin-treated Cotton Fabrics", which was the first-place winner; Delaware Valley Section's "Concurrent Dyeing and Finishing of Cellulosic Fibers", the second-place winner; Rhode Island Section's "A Study of Fluorocarbon Finishes and Their Effects on Dyed Fabrics", the third-place winner; Northern New England Section's "A Study in Union Dyeing"; and Southeastern Section's "Selection of Direct Dyestuffs for Application to Undesulfured Rayon Staple".

The concluding technical session was held Saturday morning, October 8, with William S Sollenberger, American Viscose Corp, serving as chairman. The following papers were presented: "Dyeing Vinylsulfone Fiber-Reactive Dyes" by Hans Luttringhaus, Carbic-Hoechst Corp; "Status of Nonwoven Fabrics in the Textile Trade" by Howard E Shearer, American Viscose Corp; "New Fibers from DuPont" by Milton M Christie, E I duPont de Nemours & Co, Inc; "Recent Developments in the Dyeing of Verel Modacrylic Fiber" by R G Fortune and V G Paul, Tennessee Eastman Co; "New Color-measuring Instrument for Use by the Textile Industry" by Frank J Rizzo and A O

HEAD TABLE—ANNUAL BANQUET—(l to r): Bertrand W Hayward, president, Philadelphia Textile Institute; William S Sollenberger, American Viscose Corp, vice president, Central Atlantic Region; W George Parks, Univ of Rhode Island, vice president, New England Region; Thomas J Gillick Jr, American Felt Co, chairman, Intersectional Contest Committee, Irene Blunt, guest speaker; Weldon G Helmus, president; Pastor Floyd A Paules; Fred V Traut, Globe Dye Works Co, convention chairman

HEAD TABLE—ANNUAL BANQUET—(l to r): William H Bertolet III, Laurel Soap Mfg Co, Inc, convention cochairman; Herbert A Stauderman, Howes Publishing Co, Inc, chairman, Individual Membership Committee; George O Linberg, Melrose Chemical Co, past president; A Henry Gaede, Laurel Soap Mfg Co, Inc, vice president, Southern Region; Joseph H Jones, Phoenix Dye Works, vice president, Western Region; Arnold M Sookne, Harris Research Laboratories, 1960 Olney Medalist; Elliott Morrill, Corn Products Co, chairman, Conventions Committee; Charles A Sylvester, E I duPont de Nemours & Co, Inc, chairman, Executive Committee on Research; Clarence A Seibert, Scholler Bros, Inc, chairman, Delaware Valley Section

Ramsley, U S Army Quartermaster Research & Engineering Command; and "The Textile Industry Looks Ahead" by Irene Blunt, consultant to the American Cotton Manufacturers Institute and formerly executive director of the National Federation of Textiles. Miss Blunt also served as guest speaker at the Annual Banquet on Saturday evening.

The Annual Banquet, the concluding affair at the Convention, was once again well attended. Speakers, in addition to Miss Blunt, were Weldon G Helmus, delivering the President's Address (the text of which appeared in the October 31st issue); Convention Chairman Fred V Traut; Intersectional Contest Chairman Thomas J Gillick Jr, who announced the results of the '60 Contest; and Herbert A Stauderman, Howes Publishing Co, Inc, chairman of the Individual Membership Committee.

Mr Stauderman announced the winning Sections in the Membership Drive Incentive Award Plan, which was set up last year as part of the nationwide drive for new individual members. AATCC's 14 Sections were

Charles E Harrison, American Viscose Corp, fills out application for membership at Membership Drive Headquarters during the 1960 Convention. Also pictured from left to right are Lydia O'Connor, "Miss New England Region"; Janet Hamil, "Miss Central Atlantic Region"; Betsy Reeves, "Miss Membership Drive"; Marie Drake, "Miss Western Region"; and Nancy Todd, "Miss Southern Region".

George Paine (third left), executive secretary, and President Weldon G Helmus, pose with "Miss Membership Drive" and her four regional assistants at Convention Membership Drive Headquarters. A record number of new members were signed up at the Sheraton Hotel during the three-day Convention last month.

The ladies arrive at Cherry Hill Inn for Friday Luncheon

arranged into two groups—with the seven smaller sections in Group I, and the seven larger sections in Group II.

Winner in Group I was the Western New England Section with an increase of 19.9%, followed by Washington with 16% and Pacific Northwest with 14.9%. Piedmont Section took Group II honors with a 12% increase, followed by Delaware Valley with 6% and the Metropolitan Section with 5.2%.

Both the Western New England and Piedmont Sections were awarded $500 each to provide for textile education scholarships to be made in the name of the winning Sections.

The Banquet was concluded with a program of professional entertainment, entitled "Great Moments of Broadway".

A goodly number of wives accompanied their husbands to the Convention, and two special events were provided for them. In addition to daily "coffee/and" in the hospitality room, a Ladies Welcome Party was held Thursday afternoon, and a special luncheon at the Cherry Hill Inn in New Jersey highlighted a tour on Friday.

Thirty-five exhibitors set up displays in the Pennsylvania, Constitution and Independence Rooms, attracting a steady flow of visitors during each of the three days.

Those attending this year's Convention were invited to participate in next year's 40th Anniversary Convention in Buffalo, NY, September 27-29. It will mark the first AATCC Convention to be held in Buffalo, and a large attendance from Canada is anticipated.

ACTIVITIES OF THE LOCAL SECTIONS

New England Regional Meeting Slated

A two-day regional meeting of the three Sections in the New England Region has been scheduled for May 5-6, 1961 at the Jug End Barn at South Egremont, Mass.

This is the first attempt of the New England Sections to hold a regional meeting. Although still in the planning stages, a fine two-day technical program is expected to be developed.

The Jug End Barn has excellent recreation facilities, and can be easily reached from all points in New England.

Further information will be released in the near future as definite plans are formulated.

Piedmont

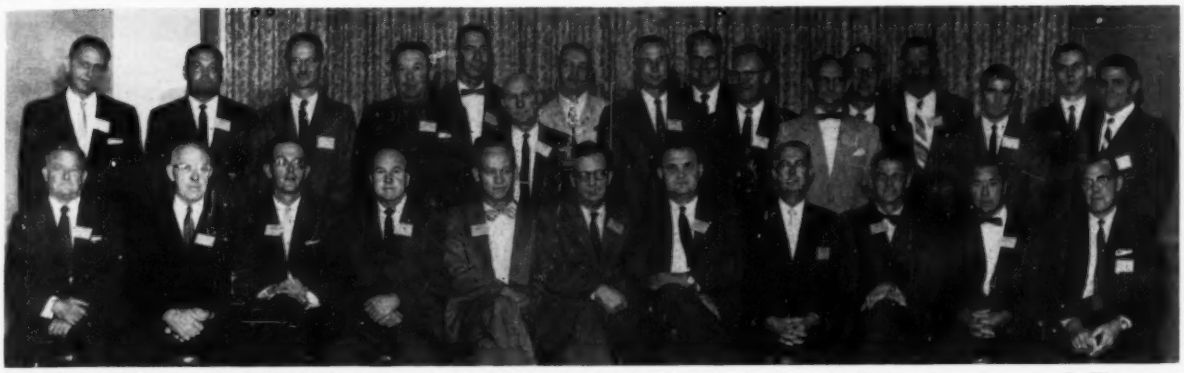
PIEDMONT SECTION held what will be its last Fall Meeting of the Section as presently geographically constituted, at the Hotel Charlotte in Charlotte, NC, September 23-24, 1960. This is due to the fact that two final organizational meetings were held Friday evening, September 23, 1960, at which time approval of membership was given to form two new sections that will embrace "Northern North Carolina-Virginia" and "The State of South Carolina". These meetings contributed heavily to the record registration of members and guests of 453.

The meeting was officially opened with the meeting of the general research committee, attended by some 65 people. A brief coverage of the Section's Intersectional Contest paper was given at this meeting.

The research meeting was followed by the officer's luncheon, which was attended by guest speakers and the two recipients of the Charles H Stone Scholarship for the current year, T W Templeton, Clemson College, and Clayton Asbury, NC State.

The afternoon technical meeting was divided into two "interest" groups. The hosiery group, under the chairmanship of Henry Dixon, had as its speaker Jack S Christie, Proctor & Schwartz Co, who presented a talk on "Automatic Color Control Applied to Hosiery Processing". This section of the technical meeting was attended by some 50 members and guests.

The second group heard two papers: C A Robinson, Arnold Hoffman & Co, Inc, on "The Procion-Resin Process", and G M Gantz, General Aniline & Film Corp, on "Optical Brighteners, Their Properties and



PRINCIPALS AT PIEDMONT SECTION'S FALL MEETING—Seated, l to r: Raphael E Rupp, Councilor; A R Thompson, custodian, national treasurer; W E Rixon, Councilor; Robert L Ward, treasurer; Richard E Rettew, secretary; Linton C Reynolds, chairman; Vincent B Wright Jr, vice chairman; W Colby, secretary, Charles H Stone Scholarship Trust; Edward A Murray, Councilor; E Philip Lavoie, sectional committeeman; Carl A Bergman, sectional committeeman in charge of meeting.

Standing, l to r: George M Gantz, guest speaker; R G Lawrence, chairman, technical session; C A Robinson, guest speaker; Robert McKown, chairman, Social Committee; Weldon G Helmus, national president; Joseph Lindsay, chairman, Education Caommittee; George P Paine, executive secretary; D W Chaney, guest; Henry Dixon, chairman, technical session; Charles L Zimmerman, Councilor; Neal A Truslow, Councilor; J C King, Councilor; A H Gaede, vice president, Southern Region; Clayton Asbury, North Carolina State College, scholarship winner; T W Templeton, Clemson College, scholarship winner; Jack S Christie, guest speaker.

Lightfastness Characteristics". Some 225 members and guests attended this portion of the technical meeting.

A social hour preceded the banquet at which George L Simpson, director of the Governor's Research Triangle, gave a well-illustrated and interesting resume of the progress of the Research Triangle in the last year and a half. The banquet was attended by some 187 members and guests.

This meeting was arranged for and conducted by Sectional Committeeman Carl A Bergman, General Aniline & Film Corp.

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Metropolitan

METROPOLITAN Section held its second meeting of the 1960-1 season Friday evening, October 21 at Kohler's Swiss Chalet, Rochelle Park, NJ, with Chairman John A Komninos presiding.

In the absence of George A Jonic, chairman of the Nominating Committee, Mr Komninos read the Committee's selections for office as follows: *Chairman*—P J Fynn, J C Penney Co; *Vice Chairman*—Richard P Monsaert Jr, American Felt Co; *Secretary*—G A Jonic, American Cyanamid Co; *Treasurer*—E J Grady, Nopco Chemical Co; *Councilors*—Arthur R Wachter, American Viscose Corp, one year; Emil C Hansen, two years; Charles R Trommer, Boris Kroll Labs, three years; John A Komninos, three years; *Sectional Committee*—P J Wood, Royce Chemical Co; C H Brubaker, Standard Bleachery Co; Harry Moore, Burlington Mills; A E Johnson, National Institute of Drycleaning. As there were no other nominations by petition, the above were elected to serve for 1961.

Speaker of the evening was Frank C Rippner, Textile Development Laboratories, Union Carbide Chemicals Co, Division of Union Carbide Corp. His subject was entitled "Dyeing and Finishing of Wool and Dynel Blends".

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Rhode Island

RHODE ISLAND SECTION held its October 28th meeting at the Providence Engineering Society with approximately forty members and guests in attendance.

Charles E Hoey, Rohm & Haas Co, presented a paper entitled "Application Principles of Acrylic Backcoating".

Edward Alexander, chairman of the R I Section's Intersectional Contest Committee, read the Section's 1960 entry, "A Study of Fluorocarbon Finishes and Their Effect on Dyestuffs", for the benefit of members who did not attend the convention.

The Section's next meeting will be held December 2 at the Sheraton Biltmore Hotel, Providence, RI.

Southeastern

SOUTHEASTERN SECTION AWARDS TWO SCHOLARSHIPS—To further stimulate textile student interest in wet processing, the Southeastern Section is currently awarding two scholarships. These go to students in textile chemistry at Georgia Institute of Technology and Auburn University. The Section, a pioneer in such scholarships, recently increased to the double award.

Recipients and Southeastern Section officers are pictured at a recent meeting—(l to r): Charles Stewart, student, Georgia Tech; Robert B Hallowell, Coats & Clark, Inc, Southeastern Section chairman; H Gillespie Smith, American Cyanamid Co, chairman of the Scholarship Committee; Alton Franklin Painter, Auburn

ANNUAL OUTING—PACIFIC SOUTHWEST SECTION

September 24-25 • Apple Valley Inn & Country Club, Apple Valley, Calif

Foursome on the Apple Valley Country Club Course, with Joshua tree in the background (l to r): Herb Vogel, Jenkins-Wright Co, Inc; Mr & Mrs Robert Mishell, Dyemasters Inc; William James, Jenkins-Wright Co, Inc

Outing Chairman Serge Dadone, Los Angeles Piece Dye Works, and Mrs Dadone

L to r: Mr & Mrs Milton Greene, Industrial Textile Co; Mrs J Carlin; John Smith, Dyemasters Inc; J Carlin, Industrial Textile Co; Mr & Mrs Wally Wilson, McKesson-Robbins; Mrs Harry Sprecher, Industrial Textile Co

L to r: Section Chairman Walter E Kramer, Jenkins-Wright Co, Inc; Mrs. Kramer; Publicity Chairman Victor Boutin, Carbic-Hoechst Corp; Mrs Boutin

L to r: Mr & Mrs Robert Fliegel, National Dyeing & Finishing Corp; Mr & Mrs Richard Demuth, Dyemasters, Inc; Mr & Mrs Norman Garret, National Aniline Div, Allied Chemical Corp

ELECTED TO MEMBERSHIP

November 3, 1960

No designation after name indicates Senior
(A) indicates Associate
(J) indicates Junior
(S) indicates Student
* indicates transfer from another class of membership.

NEW ENGLAND REGION

Northern New England Section

Richard L Porter
*William J Kennedy Jr**

CENTRAL ATLANTIC REGION

Metropolitan Section

Richard T Stark
Derek E Hoxby (A)

Delaware Valley Section

*Thomas A Martone**

SOUTHERN REGION

Washington Section

Margaret Smith
Barbara S Watson

Piedmont Section

Rolf H Gade
Henry C Reese Jr
Edward E Silver
*Charles E Daniels**
*Henry M Reynolds**

South Central Section

Norman W Birchler Jr (A)

Southeastern Section

Albert S Cooper Jr
John T White
*John B Woolfolk**

WESTERN REGION

Pacific Southwest Section

Nicholas P Chloros

Pacific Northwest Section

Leo M Bergman (A)

Abstracts

(*continued from page 54*)

blankets are now being used in England: cellular cotton blankets; Terry toweling blankets: Calnamesh blankets (consisting of two cotton-Fibro (rayon staple) sheets, and in between, a warp-knitted mesh fabric of Fibro-cotton blended yarn, all sewed together like a quilt); and blankets of man-made fibers, eg, Terylene and nylon.

The relative warmth of different types of blankets is obviously a matter of importance, and it is difficult at this stage to come to any firm conclusions. The author discusses the various types in this matter of warmth.

Research is continuing in the development of blankets of mixed types such as Fibro and Terylene; Fibro, cotton and nylon; wool and cotton; and wool and Fibro.

The wool industry is of course greatly concerned over these developments, and is devoting great attention to the problems of improving the quality of woolen blankets and of determining the best method of cleansing and sterilizing them.

Shrinkage of blankets in the laundry is also discussed, and it is pointed out that blankets containing wool can be given an anti-shrink treatment that will enable them to withstand various cleansing and sterilizing processes. Some hospitals, nevertheless, feel that cotton blankets can withstand more robust treatments than woolen ones.

Regarding flammability, it is stated that wool is appreciably less flammable than cotton. Some of the synthetics (eg, nylon and Terylene) have low flammability.

Regrading cost, the cellular cotton type of blanket appears to be the cheapest currently available.

In America, "hygienated" blankets have been developed which are claimed to have received an "exclusive antiseptic treatment that makes this blanket resistant to germs and bacteria for the life of the blanket." Success in this field might greatly alter the whole situation.

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Moisture and Viscose Rayon

Wiegerink, J G, *Textile World 110*, 40-2, June, 1960

Moisture is a trouble-maker when you're dealing with viscose rayon. Too much of it means more friction during winding — and therefore strained yarn. Too little of it, and the yarn gets stiff. But control it right, and you take a step forward in quality control, the author states.

Viscose rayon, like all other textile yarns, absorbs moisture from the air. How much it retains depends on temperature and humidity, but it is much more than some other fibers will absorb (eg, the synthetics). A chart is included, showing the equilibrium moisture content of viscose rayon at different r h at 75°F, compared with wool, mercerized and unmercerized cotton, silk, acetate rayon, nylon, Orlon and Dacron. At 75°F, r h 50%, viscose rayon absorbs 11% moisture, compared with 3% for nylon and 0.5% for Dacron.

Cross-sections of wet viscose rayon fibers show a swelling of 100%. By comparison, wool, cotton and silk swell 30-40%, nylon 5%, and the acrylics and polyesters 0%.

Over-heating or over-drying viscose rayon reduces moisture pickup to some extent, but will result in loss in strength and poorer dyeability. Some sizing materials will increase the regain values.

The rate at which a textile fiber attains equilibrium moisture content depends on several factors: the type of put-up (eg, skeins or packages), the r h, temperature and circulation of the air, and the moisture content prior to conditioning. Increasing the air circulation and operating at high temperature and humidity makes possible the proper conditioning of tightly woven packages.

Viscose rayon can stand a stretching force of 0.5 gpd in winding, weaving or warping without creating dyeing defects such as shiners, strained ends, etc. But this condition is only correct at normal regains, no higher than 12%. At 15% regain, the maximum stretching force it will stand is reduced by one-half. This 15% regain is the equilibrium moisture value for rayon at 70% r h, a not unusual condition in mills.

Increasing the moisture in viscose rayon and acetate increases friction during winding. As the yarn gets moist it gets softer and offers more surface for drag across the tension guides.

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The Theory and Practice of Sodium Chlorite Bleaching

Skelly, J K, *J Soc Dyers Col 76*, 469-79, August, 1960

The use of sodium chlorite as a bleaching agent for cellulosic fibers permits shorter processes, with lower weight-losses, direct bleaching of lignified impurities difficult to bleach by other methods, and minimum risk of chemical damage to the fiber. On the other hand, chemical costs are high, and they may be accompanied by high overhead costs for the necessary machinery. Because of its relatively high cost, sodium chlorite must be used in the most efficient way possible, with minimum formation of chlorine dioxide and sodium chlorate and maximum decomposition of the agent itself.

The conditions for sodium chlorite bleaching of cellulosic fibers which have become accepted are as follows: pH 4-7, at 60-100°C, for times varying from 30 minutes to six hours; with concentrations up to 5 gpl in long liquors, and in padding processes 20-30 gpl for cotton and as high as 70 gpl for linen. Suitably chosen conditions cause no measurable oxidative damage to natural and regenerated cellulosic fibers, and polyamide, polyester and acrylic fibers can also be bleached.

The main problems associated with sodium chlorite bleaching in practice are: 1) choice of a suitable method of activation of the bleaching agent; 2) selection of suitable resistant materials for construction of the bleaching plant; 3) design of suitable machinery.

Well-known activators fall into the following groups:

1) *Acids.* Various acids can be added to control the pH between 3 and 5, eg, phosphoric, acetic or formic acid. Values below pH 3.5 are not used because of excessive production of chlorine dioxide and risk of corrosion.

2) *Salts.* Various sodium phosphates, as well as sodium formate and acetate, have been recommended. These are buffer salts which stabilize the pH during bleaching. They are also claimed to control evolution of chlorine dioxide and to protect stainless steel from corrosion.

3) *Hydrolyzable Organic Compounds.* Organic esters, eg, diethyl tartrate and ethyl lactate, are said to promote excellent bleaching with a minimum of chlorine dioxide and corrosion, but require higher temperatures and more concentrated solutions.

In general, acid chlorite solutions at pH 4 and 80-100°C attack iron, copper, nickel and their alloys. Pure aluminum with a coating of oxide, lead with a coating of sulfate, and wood have some resistance, while glass, ceramic linings, stoneware, glazed earthenware and titanium are completely resistant. Certain plastics, eg, polypropylene, also have good resistance. Normal 18/8 stainless steel is attacked, but is improved by addition of 2-5% molybdenum.

The author describes in detail his investigation of the decomposition of sodium chlorite during the bleaching

of flax at different pH values and various temperatures. He has a number of recommendations for suitable bleaching plant equipment.

Fifty-four references to the literature are cited.

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The Dyeing of Cellulose Acetate with Disperse Dyes. 9. Effect of Varying Acetyl Value

Bird, C L, and Tabbron, G, *J Soc Dyers Col 76*, 217-22, April, 1960

Cellulose triacetate was first marketed in fiber form in 1954. Compared with the secondary acetate fiber (54-55% acetic acid content) the triacetate fiber (61.5-62.2% acetic acid content) swells much less in water, and therefore dyes more slowly. It is more crystalline than the secondary acetate, and should therefore show a lower fiber saturation value for dyes.

The dyeing properties of cellulose acetate are evidently related to its acetyl value, so it was decided to measure the rate of dyeing and maximum uptake of disperse dyes on cellulose acetate yarns within the range 54.0-62.1% combined acetic acid.

Fiber saturation values were determined at 90°C for two groups of three similar disperse dyes on secondary cellulose acetate, cellulose triacetate and three cellulose acetates of intermediate acetyl value. The results have been correlated with the accessibility of the substrates and the hydrophobic character of the dyes and substrates.

The rates of dyeing at 90°C of two commercial dyes on the five yarns were found to decrease with increasing acetyl value, especially above 58% acetic acid content.

The lower regain of cellulose triacetate, compared with that of secondary cellulose acetate, can be attributed not only to the more crystalline nature of the triacetate, resulting in lower accessibility, but also to the very small number of water-attracting hydroxyl groups in the triacetate.

The authors give full details of the experimental work. They comment that the nature of the linkage between disperse dyes and cellulose acetate is still a matter of controversy. It has been suggested that the more hydrophilic disperse dyes, ie, those containing *N*-β-hydroxyethyl groups, combine largely through hydrogen bonds, whereas the more hydrophobic dyes, ie, those containing ethyl groups, are absorbed mainly through nonpolar Van der Waals forces. On this basis the most hydrophilic disperse dyes should show the greatest fall in fiber saturation value in passing from secondary acetate to triacetate. The experimental work showed that this is in fact the case.

Fourteen references to the literature are cited.

•

The Application of Reactive and Direct Dyes to Rayon Staple by Continuous Methods

Cheetham, R C, *J Soc Dyers Col 76*, 95-102, Feb, 1960

The principles of continuous piece dyeing have been studied, and an investigation has been made into the possible application of these principles to viscose staple fiber, with particular reference to dyeing for the carpet trade, where large weights to a color are often called for.

Various machines capable of conveying staple fiber in a continuous manner have been considered, including the necessary machines for opening, dyeing, squeezing, steaming and drying. Development work in the past two years has resulted in one continuous dyeing system based on the Fleissner revolving drum principle, which is described. This machine is now operating on a commercial scale with 15-denier crimped Fibro (rayon staple) for use in tufted carpets. An alernative dyeing system based on the Callaghan machine (also described) for bonded nonwoven fabrics is also being developed, and attention has also been given to the possibility of using scouring bowls.

It has been demonstrated that reactive dyes can be applied satisfactorily in continuous systems, using the method whereby the fiber is impregnated with dye-alkali mixture and dried; only the cold-dyeing members of the Procion range have been applied commercially.

The application of direct dyes to Fibro in continuous systems has been studied in some detail, with main emphasis on the measures to be taken to ensure regularity of color over a long run. This is particularly important in view of the large proportion of dye absorbed by the fiber during immersion in the dye liquor. Several methods have been examined for means of arriving at the necessary adjustments to the feed liquor.

Wetfastness of fiber in these continuous systems is in some cases lower than that obtained by normal methods of dyeing, but adding salt or increasing the temperature of impregnation minimizes the disparity.

Fibro dyed on the Fleissner system has been subsequently processed to yarn on the modified cotton and the woolen systems of spinning, No particular difficulties have been encountered, and the fiber is more lofty than when dyed in enclosed machines.

Rayon staple stock-dyed by the continuous method is compared with mass-colored (spin-dyed) rayon. The latter has the advantage of better wet fastness, but the number of shades is limited.

•

Dyeing of Orlon Sayelle Bi-component Acrylic Fiber

Anon, *Dyes Chem Tech Bull (du Pont) 16*, 81-8, Aug, 1960

Orlon Sayelle presents a new concept in acrylic fibers in that it has a permanent reversible crimp and "crimp memory." These crimp properties permit the production of fabrics possessing greater cover and compressional resilience and improved bulk and loft. These properties make improved elasticity and shape-holding qualities for knit goods and greater liveliness for woven fabrics.

Orlon Sayelle can be dyed with selected cationic and disperse dyes in standard mill equipment. Following are the chief differences in dyeability between Orlon Sayelle and Orlon 42:

1) Cationic dyes have a faster dyeing rate on Orlon Sayelle, requiring exact temperature control, use of a dye retarder, and selected dyes; Orlon Sayelle has a greater capacity for these dyes.

2) Disperse dyes show considerably less buildup on Orlon Sayelle, and are shade-sensitive to variations in the pH of the dyebath.

Selected cationic dyes have shown good shade control on the new fiber, excellent fastness to AATCC Washing Test #3, and good fastness to light. A list of suitable dyes is included. Only those dyes which are shade-insensitive to dyebath pH variations should be used. Also, owing to the relatively fast dyeing rate of cationic dyes on Orlon Sayelle, a number of fast-exhausting dyes in this group are difficult to control and are not recommended.

Level dyeings with cationic dyes on this fiber can be obtained by raising the temperature of the dyebath from 180°F slowly and stepwise to the boil. The exact procedure to be followed is described. The addition of an anionic product "Compound #8-S", controls the fast strike of cationic dyes on this fiber.

Almost all disperse dyes recommended for use on Orlon 42 give satisfactory results on Orlon Sayelle; but disperse dyes should be limited to pastel shades only. The dyebath

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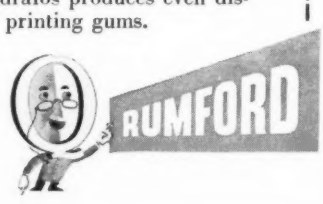

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should be kept neutral (pH 7). Full details are given for the dyeing operation.

Orlon Sayelle is stained about the same or slightly more with acid, direct, chrome and metallized dyes when compared with Orlon 42.

Instructions are given for scouring, bleaching (with Textone) and stripping this fiber. As a partial stripping agent for cationic dyes, the author suggests soap flakes, applied at the boil.

●

Dyeing Terylene on a Laboratory High-temperature Beam Machine

Garrett, D A, Haden, I E and Smith, F R, *Dyer 124, 405, 408, 410, 413, Sept 9, 1960*

Over the last ten years the advantages of dyeing Terylene in package, top and loose stock form at high temperatures has been clearly demonstrated. By far the greater part of these forms of Terylene is now dyed under high-temperature conditions, with consequent improvements in levelness of dye uptake, economy of dyestuff usage, and fastness properties.

Continuous-filament Terylene fabrics in the past have been dyed either in the covered winch or in the enclosed jig. In the latter, the dyeing temperature is limited and poor interchange of dye between liquor and fabric results. High-temperature jigs are slow in operation and present problems in accurate shade matching.

The author describes experiments made in dyeing Terylene fabrics in a high-temperature beam-dyeing machine, constructed by the Longclose Engineering Co. The fabric was wound on a 3″ beam perforated with ⅛″ holes. The direction of the dye liquor through the fabric was reversible. A sampling tank was provided. The dye liquor was started at 60°C, and the temperature was raised to 130°C. The time required for dyeing varied according to the type of fabric and the depth of shade.

Before dyeing, the fabrics were heat-set so as to stabilize them against shrinkage during the dyeing operation. Scouring was done either on a winch or on a jig prior to setting.

The length of cloth that may be dyed satisfactorily is governed not only by the number of layers of fabric but also by its porosity and by the power of the pump.

A diagram of the machine is shown, and its operation described.

Commenting on the results, the authors state that the coverage of filament fabrics dyed on the beam is superior to that achieved by other methods, including pressure jigs, provided that the limiting capacity of the beam is not exceeded.

A difficulty was encountered in dyeing warp-knit fabrics, which invariably showed water-marking.

Blends of Terylene with both cotton and wool have also been successfully dyed on the high-temperature beam.

●

Continuous Solvent Scouring for Raw Wool

Anon, *Textile Recorder 78, 92-3, Sept, 1960*

The solvent scouring process described in this article, for which a number of important claims are made, has been developed by De Laval in Sweden.

The DeLaval process differs from the American and Australian processes in that it utilizes paraffin as the scouring agent in place of more volatile petroleum distillates with relatively low flash points and high vapor pressures. These solvents involve fire hazards and necessitate batchwise processing in closed containers. They are said to remove only the grease from the wool, leaving the other impurities to be removed by a subsequent water scour, a procedure which again involves the possibility of felting of the wool. The solvent used in the De Laval process has a flash point of 45-50°C and a low vapor pressure, and it is claimed that the process effectively cleans the wool ready for carding, without any subsequent water scour being necessary.

The process is described in great detail, and is illustrated by a diagram. The raw wool is first subjected to a mechanical prescour with oil forced through the mass by a pump, and then passes through several scouring units in succession, each followed by a press. It is finally centrifuged. Only a small amount of scouring oil remains in the wool, and this is removed during backwashing.

The relatively low-boiling scouring liquid is separated from the wool grease by vacuum distillation. Up to 90-95 percent of the grease in the raw wool is recovered, it is said.

Wool scoured by this process required less spinning oil. When carded it has a greater staple length (especially in the case of colored wools), compared with water-scoured wool, and produces yarns with better spinning and weaving properties.

●

Fast, Efficient High-temperature Dyeing

Anon, *Textile World 110, 88, Sept, 1960*

High-temperature dyeing for packages or skeins of yarn helps to overcome many of the problems presented by fiber characteristics, the physical condition of the package, and common variations in dyestuffs.

Since their beginning, about 1948, high-temperature dyeing machines made in the U S or Europe have been constantly improved. Temperatures up to 280°F are now possible in modern machines, but actual dyeing is not done at this level. Dyers find that 240°F is about the maximum working temperature for best results on man-made fibers. Direct or developed dyes on cotton work best at 230°F.

When the dyebath is raised substantially above 212°F, several differences are noticeable in the behavior of the dyes and the manner in which all fibers react to them. Dyestuffs diffuse into the fibers more readily at 240°F than at 212°F, and often dyes are more soluble at the higher temperature. The polyamide, polyester and acrylic fibers are more receptive to dye at high temperatures, which eliminates the need for carriers and promotes level dyeing. In addition, there is a substantial saving in the time of dyeing at high temperatures (eg, reduced from four hours to 1½ hours on rayon cakes).

To avoid the complications that arise from uneven tension within rayon cakes, the author recommends preheating the cakes either in saturated steam at 270°F or in water at 280°F.

The actual dyeing process on rayon produces better results when it is done at temperatures well above the boil; eg, Brown BR dyes unevenly at 190°F, but produces a solid dyeing all through the cake at 225°F.

Nylon is sensitive to over-oxidation and may lose up to 50 percent of its tensile strength if compressed air is used to maintain static pressure in the dye vessel. For that reason, it is advisable to use nitrogen in place of air to produce the required static pressure.

High-temperature dyeing also speeds up the dyeing of yarn in skein form and narrow fabrics such as zipper tapes. High-bulk Orlon dyed in these machines retains all the fluffiness and soft hand that is characteristic of skein dyeing.

The machines are designed so that samples may be taken or dyes added without interrupting the high-temperature dyeing cycle.

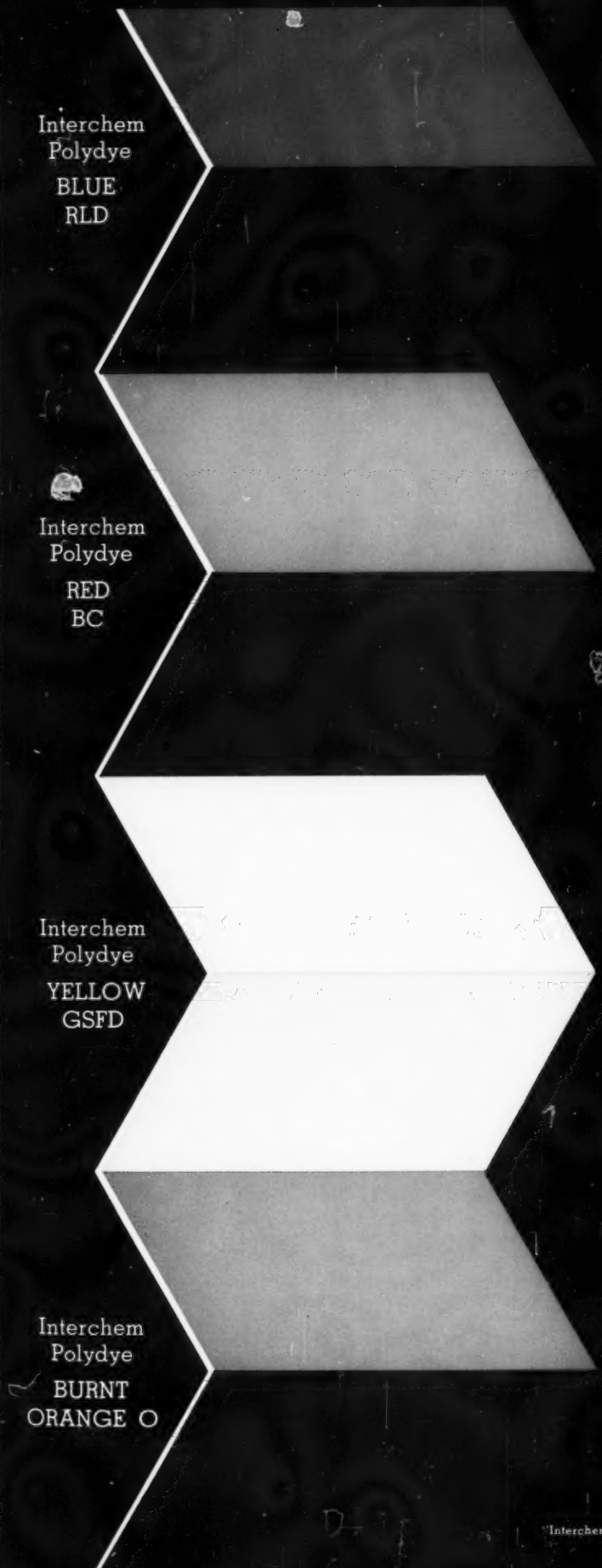
●

The Crease-resist Process. Identification of Amino-aldehydes

Marsh, J T, *Textile Recorder 77, #926, 72-4; #927, 58-9; #928, 63-4 (1960).*

From time to time it becomes desirable, or even necessary, to examine

(*concluded on page 104*)



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News of the Trade

NRMA Promoting "Sure Care Symbols"

What is hoped will be a significant solution to the long-time problem of consumer education in the proper washing and cleaning procedures for the broad variety of fabrics now in use was explored recently in a symposium of leading trade association executives from the retailing, textile, and garment manufacturing fields conducted by the Public Relations Committee of the National Retail Merchants Association.

Edward F Engle, secretary of the NRMA's Public Relations Committee, in explaining the purpose of the meeting said, "Too often cleaning instructions loosely attached to a garment disappear after first use. The simple answer to this dilemma is symbol standardization. Symbols that signify, clearly and graphically, the proper care and treatment of any fabric could be visibly imprinted on finished articles of merchandise."

Mr Engle told the gathered trade association officials that, as a service to the American consumer, the NRMA was sponsoring and promoting a standarized group of symbols called "Sure Care Symbols." "The uniform use of these 'Sure Care Symbols' can be an asset to manufacturers of garments, cleaning equipment and cleansing agents. Consumer complaints on faulty washing, ironing and cleaning care should greatly diminish," he said.

Ephraim Freedman. chairman of the NRMA Technical Committee and director, Macy's Bureau of Standards, made a presentation on the "Sure Care Symbols" and recounted the lengthy research which led to the development of the symbols.

Mr Freedman, in his presentation, said:

"For many years, textile fabric manufacturers, finishers and dyers, converters, garment and other textile product producers, retailers and consumers have been plagued with the colorfastness of textile products.

"The problem assumed major proportions in the late 20's when the battle between silk and rayon waxed most furiously.

"Until then, the industry had concerned itself principally with the task of determining what particular washing procedure would do the least damage to the textile fiber.

"It was common knowledge that harsh soaps, bleach or hot water would cause woolens to shrink, and silks to yellow, in addition to causing much staining and fading of colored goods.

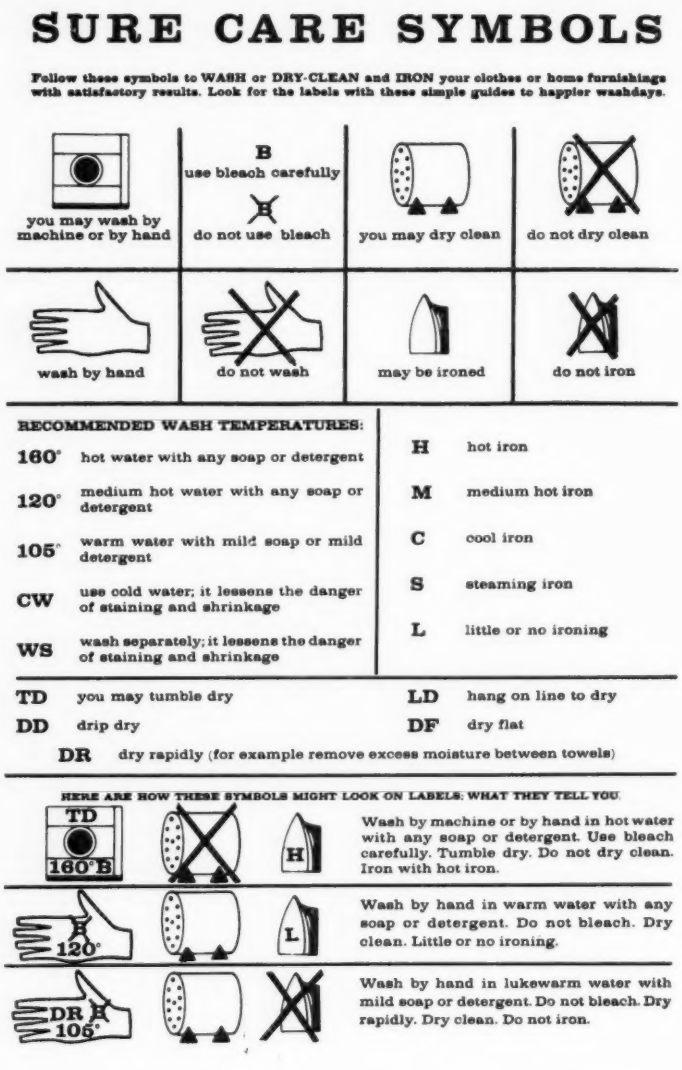
"In 1929, I submitted a paper to the American Association of Textile Chemists and Colorists entitled 'A Proposed Method of Describing Washable Materials and Garments' based on laundering tests advocated by the Association.

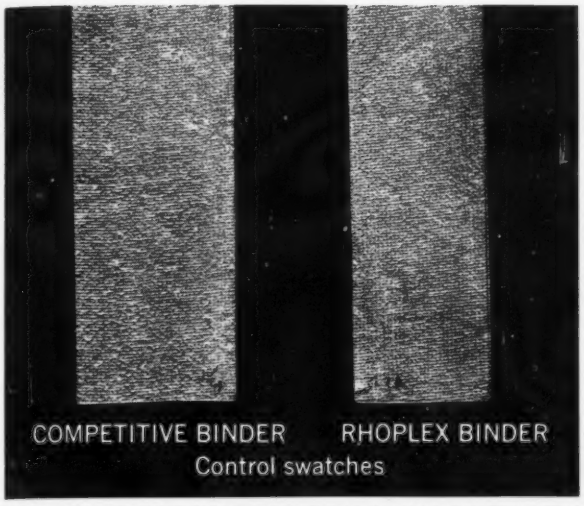
"I suggested that they be described as Methods 1, 2, or 3, that is, Washable (Method 1) for commercial laundering; Washable (Method 2) for Ordinary Home Laundering; and Washable (Method 3) for Careful Washing.

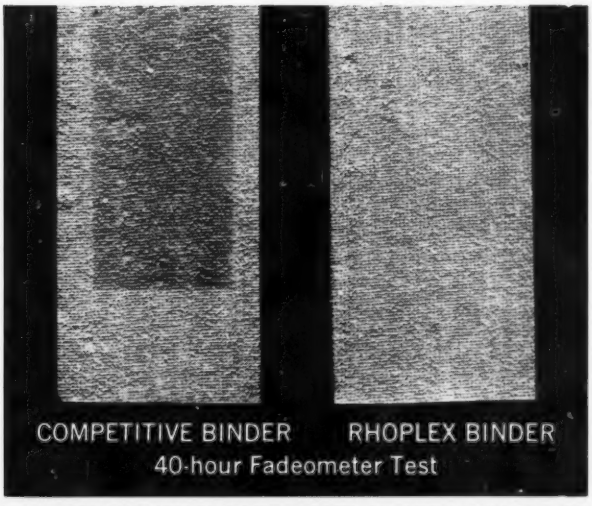
"The mention of Methods "1", "2" and "3" was criticized for implying that "1" was superior; "2" somewhat inferior and "3" quite inferior. Also the suggestion was made that separate washing instructions be written for silks, for rayons and for cottons.

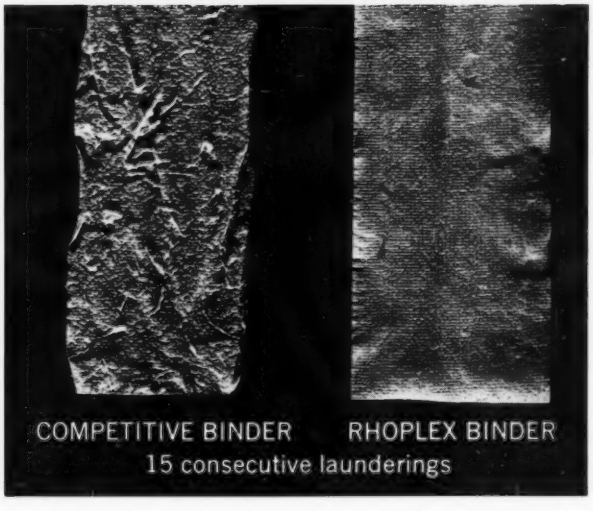
"The validity of the criticism of method designations "1", "2" and "3", was recognized and they were changed to "B" (indicating "bleach" and Commercial Laundering), "O" for ordinary home laundering without bleach, and "C" for careful washing.

"In 1929, Macy's ran a full page advertisement entitled 'Macy's Washability Requirements,' and distributed 'A circular to Vendors' containing


SURE CARE SYMBOLS
Follow these symbols to WASH or DRY-CLEAN and IRON your clothes or home furnishings with satisfactory results. Look for the labels with these simple guides to happier washdays.
you may wash by machine or by hand
B
use bleach carefully
do not use bleach
you may dry clean
do not dry clean
wash by hand
do not wash
may be ironed
do not iron
RECOMMENDED WASH TEMPERATURES:
160° hot water with any soap or detergent
120° medium hot water with any soap or detergent
105° warm water with mild soap or mild detergent
CW use cold water; it lessens the danger of staining and shrinkage
WS wash separately; it lessens the danger of staining and shrinkage
H hot iron
M medium hot iron
C cool iron
S steaming iron
L little or no ironing
TD you may tumble dry
DD drip dry
LD hang on line to dry
DF dry flat
DR dry rapidly (for example remove excess moisture between towels)
HERE ARE HOW THESE SYMBOLS MIGHT LOOK ON LABELS: WHAT THEY TELL YOU
TD
160° B
H
Wash by machine or by hand in hot water with any soap or detergent. Use bleach carefully. Tumble dry. Do not dry clean. Iron with hot iron.
120°
L
Wash by hand in warm water with any soap or detergent. Do not bleach. Dry clean. Little or no ironing.
DR
105°
Wash by hand in lukewarm water with mild soap or detergent. Do not bleach. Dry rapidly. Dry clean. Do not iron.







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these requirements. Newspapers and magazines carried editorials and articles hailing this undertaking. Vendors, including DuPont and Continental Mills, hailed this progressive step in full-page advertisements. An extensive labeling program was undertaken and washability complaints dropped. Manufacturers and retailers alike noted with considerable satisfaction the improvement brought about by this direct approach toward solving an unprofitable situation resulting from the return goods problem.

"As various conditions to which textile products were subjected in the home as well as in the servicing industries became more generally recognized, the need for additional information on labels became apparent.

"The textile industry responded nobly, affixing washability tags containing much of the needed information. Soon, the number of tags on garments began to increase—one for textile fiber identification, one for textile fiber promotion, one for washability, one for finish, one for the textile mill or converter, one for the garment manufacturer, one for the retailer, and so forth. So that now, as many as 6 or 7 tags or labels vie with each other on a simple product, all of which are undoubtedly ripped off by the consumer and consigned to the trash basket without any of them being read.

"To make matters worse, consumers buy a garment and, looking at the textile identification label find the garment is made of a number of different textile fibers. She goes to her washing machine and finds settings for linen, cotton, rayon, nylon, silk, acetate, wool and what have you. She picks up her iron and finds similar settings. She looks at her garment again and finds it is made of a mixture of some of these fibers and others not mentioned on the washing machine or the iron. What should she do? To make matters still worse, even though she may have guessed right the first time, the next time she has to clean the garment, she can't find the washing instructions and she has thrown away the textile fiber identification label.

"Recognizing the impact of this intolerable situation on all segments of the industry as well as on the consumer, the NRMA has addressed itself to a means of correcting it.

"We have all seen traffic sigis on the road. These signs, by their shape and by the symbols painted on them, tell the traveller at a glance, where he is going, or what he should do, or look out for.

"The use of these traffic signs and symbols has increased to a degree that practically all Americans have become "Symbol Conscious."

"With this in mind, we have developed and now submit to you NRMA's 'Sure Care Symbols' to help you solve your washing and drycleaning problems.

"These symbols can be stamped, printed, sewed on or cemented onto your textile product so that the consumer will know, for the life of your product, whether it is washable, drycleanable or ironable, and how to handle it.

"I suggest you give it your favorable consideration and your earnest support so that you too can reap the benefit of this—perhaps the greatest advance in informative labeling—the textile industry has ever seen."

Present at the meeting were Louis E Kates, vice president, Textile Distributors Institute; Erwin Feldman, National Association of House and Daytime Dress Manufacturers, Edward A Brandiwein, National Knitted Outerwear Association; Leonard Hammer, National Association of Blouse Manufacturers and M J Lovell, Director and Counsel, National Association of Shirt, Pajama and Sportswear Manufacturers.

Copies of he NRMA Sure Care Symbols are available from the Public Relations Committee, National Retail Merchants Association, 100 West 31st Street, New York 1, NY.

●

Texas Facility for Columbia-Southern Chrome Chemicals

Columbia-Southern Chemical Corp will soon start construction of facilities for certain chrome chemicals at Corpus Christi, Texas. This multimillion dollar plant will complement Columbia-Southern's present facilities for chrome chemicals at Jersey City, NJ.

Chrome chemicals are manufactured from chromate ore from South Africa. Engineering design for the Corpus Christi plant is being done by the W P Kidde (Southwest) Co of Houston.

Columbia-Southern entered the chrome chemical field in 1954 when it purchased Natural Products Refining Co. Since then research and technical efforts of the company have improved manufacturing methods as well as the quality of chrome chemical products. The company reports that these improvements and a specially directed sales effort have resulted in constantly increasing sales volume.

Va Smelting Increases SO_2 Capacity

Virginia Smelting Co, reportedly the country's largest producer of liquid sulfur dioxide, has announced a substantial increase in its manufacturing facilities at West Norfolk, Va. This second production unit, now in full-scale operation, employs a unique new process design which was engineered by the Company's engineering staff, according to D W Duncan, vice president-manufacturing.

As shipped commercially, sulfur dioxide is a highly purified, water-white liquid widely used throughout American industry as a raw material and process chemical.

Availability of liquid sulfur dioxide has been lagging somewhat behind industry demand for some time. This important addition to Virginia Smelting Co's facilities is expected to ease the supply situation and to encourage expansion of present established uses and investigation of new ones.

●

Butterworth Announces Lease-Purchase Plan

A lease-purchase plan for Butterworth textile machinery has been announced by Stanley Brooks, vice-president/sales, H W Butterworth & Sons Co, Bethayres, Pa.

Under the leasing arrangement, a textile manufacturer will pay a percentage of the equipment cost monthly for three to five years. Upon expiration of the lease, he can exercise a purchase option for 6% of the original equipment cost, or renew the lease at a rental rate of 2% of the original investment annually.

Mr Brooks said that a three-year lease is set up on the basis of 3.28% of the original equipment cost monthly, a four-year lease at 2.58%, and a five-year lease at 2.17%. Accelerated payment plans are also provided.

●

Crescent Chemical Named Exclusive Distributors for Rohner, Ltd in US

Effective October 1, Crescent Chemical Co, Inc, 77-44 164th St, Flushing 65, NY, became the exclusive distributors in the United States for Rohner, Ltd, Pratteln, Switzerland.

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Fiber Society Fall Meeting Attendance Exceeds 150

Scientific papers describing fundamental research on textiles and on textile processing were presented at the fall meeting of the Fiber Society held in Washington, DC, Oct 27-28, and attended by more than 150 members and guests.

James Grant, head, fiber physics investigations, Southern Regional Research Laboratories, described research to determine whether losses in tearing strength of resin-finished cotton were caused by chemical degradation of the cellulose or by increased structural rigidity which increases fiber brittleness.

The experiment included application of tension to yarns during resin treatment and study of the effects on fiber structure as a result of the treatment. Differences in inherent fiber structure as encountered in different varieties of cotton also were noted.

Losses in strength during resin treatments while fibers or yarns are slack were attributed principally to the cross-linking of fiber elements in positions unfavorable to their equalization in bearing loads.

Strain applied during treatment prevented excessive losses in strength and reduced elongation at break, but improved toughness from that of slack treatment. Premercerization minimized losses in toughness during resin treatment.

Also it was found that high tensions applied before drying, followed by low tensions during the resin cure, increased the toughness over that of slack or high-tension treatments.

Mr Grant said that the information could be useful in future studies to develop methods of stretching cotton fabric during chemical treatment to improve stiffness, toughness and tensile strength.

He feels that the study also points up the possibility of selecting appropriate varieties of cotton to meet structural requirements for specific uses.

A M Schwartz, Harris Research Laboratories, Inc, Washington, DC, reported on the laboratory's continuing study of fluid flow in fabrics. He said that for any given drop size, penetration depends on several fabric properties including fiber composition and fabric construction.

Penetration also depends on certain characteristics of the penetrating liquid including its flow behavior, surface tension, and contact angle against the fiber substance, he stated.

Finally, penetration depends on the force with which the droplet is impacted against the upper side of the fabric. Mr Schwartz showed how an air permeable fabric acts as a barrier against passage of liquids, and outlined the importance of factors contributing to the barrier action.

Stanley Backer, Massachusetts Institute of Technology, Cambridge, Mass, reported on a method of determining wear-life of textile items that would allow efficient inventory practices by large textile users such as industry and the armed services.

He presented a mathematical illustration of how new textile items will encounter damage, be repaired and reissued or discarded on a statistical basis. He also developed operational strategy for setting up a suitable repair and issuance policy.

Bertil Olofsson, Institute for Textile Research, Gothenburg, Sweden, described methods of improving efficiency of textile wet processing such as scouring, rinsing, impregnating, and dyeing. His results included a method of measuring machine efficiency by giving a relative flow between liquid and textile material. He also stressed the importance of fabric structure, and estimations of efficiency of different equipment for squeezing, vibrating, and spraying.

B L Holmes, American Cyanamid Co, Pensacola, Fla, summarized a research study on dyeing rates of acrylic fibers. A technique to detect small changes in dye rate, and to study variations such as fiber shapes, relationship of dyeing rate to variation of dyes or dye classes, temperature, and pH of dyeing, was presented.

George Bryant, Union Carbide Chemicals Co, South Charleston, W Va, based his report on the premise that in many end-uses particular textile fibers are selected or rejected because of their performance at intermediate regions of the stress-strain curve rather than at the breaking point or initial portion of the curve.

His study was a measurement of the molecular processes occurring as the test fiber was stretched through the critical "yield region" of the stress-strain curve.

The results indicated that stretching the experimental modacrylic fiber caused opening up and softening of the fiber structure similar to that which occurs when the fiber is heated. Also, the results showed that other mechanical properties of the fiber such as tensile recovery or stress-relaxation behavior can be predicted from the stress-strain curve.

The final paper was presented by R A Gill, Rohm and Haas Co, Philadelphia, Pa, and covered the effect of absorbed moisture on rayon and on different types of chemically modified rayon.

He said that results of these studies show that wash-wear performance can be best determined at some intermediate moisture content rather than being based on wet and dry crease recovery data.

This is because the least amount of fiber resilience occurs at an intermediate level. Chemical modification of rayon can improve wash-wear characteristics by decreasing the depth of minimum resilience and by changing the moisture content at which it occurs to suit the method of drying employed, he said. His results also explained the effectiveness of steam ironing and the recovery of wrinkled fabric on washing.

Session chairmen of the meeting were: William Barnard, Chicopee Mfg Corp, Milltown, NJ; Norbert Enrick, Institute of Textile Technology, Charlottesville, Va; Richard Steele, Rohm and Haas Co, Philadelphia; and Lionel Cox, Johnson and Johnson, Ltd, Montreal, Canada.

Chairman of the technical program was Charles Plummer, Chicopee Mfg Corp; and chairman of local arrangements was Lyman Fourt, Harris Research Labs, Washington, DC.

More than 150 society members and guests attended the meeting. The Fiber Society is dedicated to the advancement of scientific knowledge of fibers, fiber products and fibrous materials.

•

Goodyear Announces $1,250,000 Latex Expansion

A one-and-a-quarter-million-dollar expansion of its Akron facilities for production of Chemigum (nitrile) rubber and synthetic latices was announced Oct 25 by The Goodyear Tire & Rubber Company.

Sam DuPree, vice president of production, said the project entails enlargement of storage and production buildings, plus purchase of new equipment, resulting in a capacity increase of 15 percent.

The latex expansion, DuPree reported, includes both nitrile and styrene-butadiene types and is being undertaken to meet the increasing demands for these materials from the textile industry.

Additional Chemigum production is required because of wide acceptance of the oil-resistant, nitrile-type cold rubber for many rubber products, he said.

The expansion program is scheduled for completion in June, 1961.

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Eastman Plant Damage Estimated

Company officials have released an estimate of the damage to the Tennessee Eastman Company plant from the October 4 accident.

James C White, president of the company, issued the following statement on October 21:

"The preliminary estimate of the damage to our buildings and equipment, including the aniline plant which was totally destroyed, may exceed $4,500,000. Substantially all property damage was covered by insurance.

"Although continuing effort is being made to determine the cause of the blast, it has not yet been established.

"Production operations in other departments of the plant are near normal and employees, except those injured, are at work."

H L Ford, president of Eastman Chemical Products, Inc, which markets the products of Tennessee and Texas Eastman, also said, "We are able to fill incoming orders for Eastman fibers, plastics, and essentially all chemicals. Deliveries have been and are being maintained to our customers."

•

Jacques Wolf Moves LA Office

Jacques Wolf & Co, a subsidiary of Nopco Chemical Co, has moved its Los Angeles office to a new location at 4858 Valley Blvd, Los Angeles 32, Calif.

The move became effective October 1.

•

Corning Glass Names Distributor for Industrial Heaters in NNE

The Industrial Shoe Machinery Corp, Roxbury, Mass, has been named a franchised distributor for Corning Glass Works industrial heaters in Northern New England.

The firm will handle sale of Pyrex radiant heaters and Vycor tubular heaters to industrial processors in Maine, Vermont, New Hampshire and Massachusetts. The heaters are used in drying and curing operations.

Industrial was founded in 1947 as George Schultz and Company and a year later adopted its present corporate name. The company has specialized for several years in shoe machinery but has recently broadened its list of industrial clients.

Walukewicz

New Techniques Developed for Wica Carrier

Walter V Walukewicz, manager of Wica Chemicals, Inc's technical service laboratories, has announced the completion of extensive performance tests for Wica Carrier. Walukewicz has stated that techniques have been developed for a wider range of fibers and blends. Reportedly, extensive field trials of Wica Carrier have proved the new methods in volume runs.

•

National Conference on Water Pollution

The need for more sewage and waste treatment plants to control the increasing volume of pollution in the Nation's rivers and streams will be a principal concern of the National Conference on Water Pollution to be held December 12-14 in Washington, DC.

More than 1,000 representatives of government, industry, and civic groups will participate in the Conference, to be held in the Sheraton-Park Hotel. The Conference has been called by Surgeon General Leroy E Burney of the Public Health Service at the request of President Eisenhower and Arthur S Flemming, Secretary of Health, Education, and Welfare, and is the first Federally-sponsored meeting to consider water pollution in relation to public health and to the present and future water needs of the National economy.

The Conference program in December calls for a general session on Monday, December 12. Tuesday's agenda will include four day-long panel sessions which will cover 1) the impact of water pollution on public health and economic development; 2) water resource management; 3) the legal, financial and public responsibilities of government and industry; and 4) research and training needs. Recommendations from each panel will be discussed in a final general session on Wednesday, December 14.

At a banquet on the evening of December 12, national water pollution problems will be outlined in a round-table discussion.

The Public Health Service estimates that the construction of 4,000 new sewage treatment plants and the modernization of 1,700 more is needed to handle the municipal sewage now dumped into the Nation's rivers and streams.

Requirements for industrial waste treatment facilities are more difficult to project than those needed by municipalities. However, the Public Health Service estimates that as of now more than 6,000 new projects are required for handling waste discharges. If built in today's construction market, these treatment facilities would cost about $2 billion, including in-plant changes. To wipe out the backlog of needed industrial waste treatment construction and to provide for growth, industry will have to spend between $575 million and $600 million annually if it is to catch up with needs by 1968.

For the past four years the Federal Government has been assisting localities in their efforts to control water pollution. Under Public Law 660, passed in 1956, the Public Health Service has provided $194 million in financial aid to communities for the construction of municipal sewage treatment facilities. To this sum cities and towns have added $925 million of their own, or about five times as much. The result has been the construction of sewage disposal plants for 2,349 communities, the improvement of more than 21,000 miles of streams and the extension of clean water to a population of 21 million persons.

•

Birch Bros Purchases Rights to Bachmann Uxbridge Automatic Tacking Aligner

Birch Brothers, Inc, Somerville, Mass, has announced the purchase of the patents and all rights to manufacture and sell the Bachmann Uxbridge automatic tacking aligner from the Bachmann Uxbridge Worsted Co, Division of Hoosac Mills Corp.

Birch Brothers plans to continue supplying this equipment to the trade in addition to its standard tacking range, and is now said to be in a position to handle all tacking requirements.

Birch Brothers will maintain parts and service facilities for the automatic aligners and requests that all inquiries concerning parts, service, and new installations be addressed directly to them.

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Franklin Process Expands Southern Plants; Plans Close of Philadelphia Plant

The Franklin Process Division of Indian Head Mills, Inc has begun a major expansion and improvement program for its three southern yarn spinning and dyeing plants, Earl Rushon, vice president and general manager, said. Franklin Process is a leading producer of package-dyed yarns.

Expansion of the company's Greenville, SC, plant is nearing completion and an addition is planned for the Fingerville, SC, plant. Together, the expansion will add approximately 40,000 square feet of manufacturing area. Additional stainless-steel dyeing machines with automatic controls and hot water and heat reclamation facilities are planned for Greenville and for the company's Chattanooga, Tenn, plant. Daniels Construction Co is the contractor at Greenville.

The improvement will enable Franklin Process to serve all of its customers more efficiently, Mr Rushon said, and will replace the production of the company's plant at Philadelphia, Pa, which is to be closed within the next few months.

"Almost all of our customers are currently receiving some bleached and dyed yarns from one or more of our southern plants," Mr Rushon continued.

All current orders will be filled, so that production at Philadelphia will continue at a gradually contracting rate for the next few months.

He emphasized that executive and sales headquarters will remain in Philadelphia and that the entire sales organization will remain intact to handle the company's increased capacity. The Philadelphia plant is being closed, he said, "because it has been unable to earn a profit for some time."

●

DCAT Sets Dates for 71st Meeting

September 14-17, 1961, have been chosen as the dates for the 71st Annual Meeting of the Drug, Chemical and Allied Trades Association. The DCAT Executive Committee at its recent meeting voted to return to the Pocono Manor Inn, Pocono Manor, Pa, after an absence of four years, because of expanded facilities which provide increased room accommodations. DCAT held its annual meetings at Pocono Manor from 1952 through 1956 but because of the increased attendance at these meetings was forced to look for other sites.

Avisco to Sell Interest in Chemstrand

Monsanto Chemical Co and American Viscose Corp announced Oct 13 that negotiations are in progress for the acquisition by Monsanto of American Viscose's entire interest in the Chemstrand Corp, namely American Viscose's 50% interest in both Chemstrand's stock and Chemstrand's subordinated notes. American Viscose's share of the subordinated notes is estimated to amount to $9,500,000 at the time the plan is to be consummated.

Under the proposed plan, American Viscose would receive 3,540,000 shares of Monsanto common stock, which would be subject to special voting provisions so long as they are held by American Viscose.

Prior to the consummation of the plan, it is contemplated that Chemstrand will pay its usual annual $5 million dividend, one-half of which would accrue to American Viscose, and redeem $2,500,000 of its $12 million subordinated notes now held by American Viscose.

The plan would be subject to approval by stockholders of American Viscose and Monsanto.

After the proposed transaction is approved and effected, it is planned that Chemstrand will continue its activities as a separate entity. American Viscose is said to have no present intention of distributing or disposing of the Monsanto shares.

●

F H Ross Acquires Amica Burnett Chemical Co

Acquisition of Amica Burnett Chemical Co, Jacksonville, Fla, through merger was announced last month by F H Ross & Co, Charlotte, NC, a chemical distributing firm. In making the announcement, F H Ross Jr, president of the Charlotte company, said that H T Skaggs, president of Amica, will become general manager of the Amica Division of F H Ross & Co.

Amica Burnett has operated offices and warehouses in Jacksonville, Tampa, and Miami and Mr Ross said these branches will be retained, giving F H Ross & Co a total of 15 offices and warehouses in the Southeast.

F H Ross & Co's warehouse in Jacksonville will be transferred into the facilities which Amica has recently completed in Jacksonville.

With the addition of the existing personnel of Amica Burnett, who will be completely retained, it will give F H Ross & Co a total employment of approximately 300.

Hooker Again Expanding Sodium Chlorate Production at Columbus, Miss

Hooker Chemical Corp is substantially expanding capacity for making Oldbury-brand sodium chlorate at the Columbus, Miss, plant of its Eastern Chemical Division.

With more chlorate cells and electrical equipment required, the expansion program is utilizing space provided earlier in existing buildings, and is employing finishing equipment now on hand. Cost figures are not announced but the capital outlay will be relatively small compared to the tonnage increase, it was stated.

Construction is well underway and the new production is expected at the beginning of 1961. Although Hooker did not disclose present and anticipated sodium chlorate production capacities, this marks the fourth expansion since the original 12,000-ton-per-year Columbus plant began production in late 1954, the most recent expansion having been completed early last year. Hooker also makes sodium chlorate at Niagara Falls, NY.

The product is used as an oxidizing agent.

●

Wernertex to Provide Israeli Textile Industry Assistance Through ICA

Israel will receive professional assistance in many phases of its textile industry under the United States Government's International Cooperation Administration program. For this project, Israel, through its Ministry of Commerce and Industry, with ICA's approval and support, has retained Werner Textile Consultants of New York, a management consulting organization specialized in services to the textile industry.

Wernertex will send a team of specialists to resolve industrial production problems and to furnish technical advice on methods of marketing organization and relevant aspects of production, management, productivity, and applied research. Textile mills throughout Israel will be visited by the Wernertex team, the first three members of which were scheduled to arrive there on October 24, and special training courses will be provided for Israeli technical and other personnel.

Under ICA's worldwide assistance programs in many industries, Wernertex has previously provided similar services to the Government of Norway for improvement of the productivity of that country's entire textile industry.

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Dyeing Formulations for Vinal Developed by Althouse

A high standard of finishing formulation and methodology reportedly has been developed by Althouse Chemical Co for Vinal, a polyvinyl alcohol fiber being marketed by Air Reduction Chemical Co, a division of Air Reduction Co, Inc. The word vinal is used to describe fibers composed of at least 50% vinyl alcohol units and at least 85% (by weight) of a combination of alcohol and acetal units.

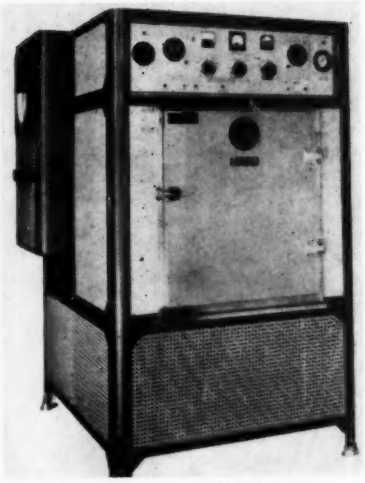
The firm of Walter H Hindle, Inc, has been retained as market development consultants for the Air Reduction Chemical Co.

The polyvinyl alcohol fibers are said to be readily adaptable for spinning, weaving and knitting by conventional systems in both 100% form and in blends with other synthetics as well in blends of cotton and wool. A range of end uses from apparel wear through domestic and industrials is now reaching the market.

Samples of Vinal together with blends and combinations of other synthetic and natural fibers were submitted to Althouse Chemical Co. At Althouse's dyestuff applications laboratory, dyes were selected; techniques were modified where necessary and exact fomulations and methodology were developed. The company furnished Air Reduction Chemical Div written technical reports and procedures for dyeing and finishing. Air Reduction has made these reports available to finishers.

Althouse determined that its premetallized Lanafast and Superlitefast direct dyes may be used on Vinal-wool blends; cotton and rayon combinations may employ premetallized Lanafast where the process must dye the Vinal and reserve the cotton or rayon. Althouse Superlite dyes may be employed in Vinal-wool combinations where both the Vinal and wool are dyed with the premetallized dyestuff for shading purposes.

It is reported that a wide range of union-shades in Vinal-cellulosic blends is obtained by conventional direct-dyeing. The resultant finished product is claimed to reach the market with its inherent qualities intact. It is reported that the fiber is strong, has high resistance to sunlight; high abrasion resistance; moisture absorption (comfort factor) and is extremely soft to the touch.



New Atlas Xenon Arc Weather-Ometer

New Xenon Arc Fade-Ometers and Weather-Ometers

Atlas Electric Devices Co, 4114 N Ravenswood Ave, Chicago 13, Ill, has announced a new line of Xenon Arc Fade-Ometers and Weather-Ometers.

With a special energy distribution very close to that of natural sunlight, the Xenon lamp is designed for use as the source of radiation in accelerated fading and weathering machines. The lamp employed in these new machines is a 6000 watt water-cooled Xenon lamp which provides sufficient intensity to permit simultaneous exposure of a large number of samples of a generous size. The specimen rack of these machines has a diameter of 37-¾″ and will accommodate up to 54 specimens 3″ × 9″ in size.

Like the carbon arc type of Weather-Ometers, these new Xenon Arc machines provide automatic control of black panel temperature, cycles, etc and are also available with automatic control of humidity during both the light-on and light-off periods of the cycle.

This Xenon lamp is also available with constant wattage transformers designed to insure a uniform radiation intensity regardless of variations in line voltage. Control equipment is also provided which permits increasing the wattage of the lamp to compensate for the progressive loss of intensity as the lamp ages. These lamps have an anticipated useful life of 2000 hours and are of the replaceable burner type so that only the burner tube and not the complete lamp is replaced, it is stated.

These new Xenon Arc Fade-Ometers and Weather-Ometers do not replace Atlas' present line of carbon arc machines but are offered as a companion line of machines for those who desire the improved spectral distribution.

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210T and 211T Transcope Transmitters

An integrated line of high-accuracy, low-cost pneumatic transmitters with optional servo power is being announced by Taylor Instrument Companies. Known as the 210T and 211T Transcope Transmitters, the instruments reportedly provide an input-to-output accuracy of ½% in the measurement of gage pressure, volumetric pressure, temperature, and volumetric load. The introduction of a sealed cartridge servo unit to maintain this high transmission accuracy under load is an outstanding feature of the new design. Typical loading arrangements might be the use of auxiliary process alarms, or encoder takeoffs, which would impose a load on the pointer system.

Exceptionally low friction encountered in the sealed indicator-driving mechanism is said to permit a 0.1% of input-span sensitivity to, and little deterioration of, low-energy input signals. A large, 11-¾″ scale, readable at 35 feet, provides an indication accuracy within 1% of actual value of the variable being measured. The 3-15 psi transmitter output may be fed directly to other indicating, recording, or controlling stations.

Taylor Industrial Companies suggests that large users of instruments will benefit from the low inventories of spare parts made possible by incorporating many of the same actuating elements in the Fulscope and other Taylor instruments. Subsequent additions to this integrated line of 210T transmitters will include shaft actuated elements, such as differential pressure elements.

Operating on process air, the new transmitters are provided with a standard bracket to permit either surface or pipe mounting. Weighing nine pounds, the instrument is housed in a 9″ × 7″ × 4-¾″ aluminum case with a resin finish to withstand severe exposures.

A non-indicating model (the 211T), with the same basic features, is also being offered.

Write for Bulletin 98385 from Taylor Instrument Companies, Rochester 1, New York.

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but ...

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but ...

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7700

7700

7700

For complete information on Emersoft 7700 write Emery Industries, Inc., Dept. G-2, Carew Tower, Cincinnati 2, Ohio.

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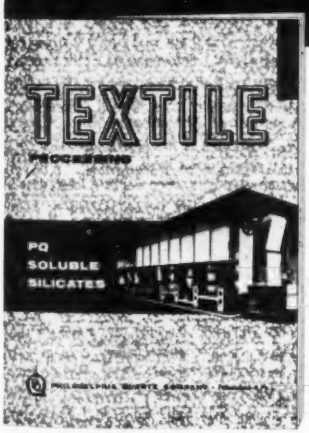

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National Lanamid Bordeaux BL

Allied Chemical's National Aniline Division has announced the addition of National Lanamid Bordeaux BL to its line of neutral-dyeing premetallized dyes.

National Lanamid Bordeaux BL reportedly can be applied in a neutral or weak bath without prolonged high-temperature processing. The new dye is said to have excellent fastness properties and to be especially suited for dyeing carpet and apparel wools, nylon, and modified acrylics.

For further information, write Department PR 74, Allied Chemical Corp, National Aniline Div, 40 Rector St, New York 6, NY.

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Startex

A series of low-cost print gum thickeners which are said to feature high color yield and ease of washout, has been announced by Morningstar-Paisley, Inc, New York, NY. The thickener series, called Startex, consists of high-viscosity products that reportedly can be used with rapidogens, vats, indigosols, and direct dyes. Although the products in solution do not form a true emulsion, they will yield the properties of an emulsion-type print thickener, it is stated. The products are said to be applicable to all types of fabrics by standard screen- and roller-printing processes.

The Startex series, based on chemically treated carbohydrates, are supplied in dry form, readily soluble in water at room temperature, it is reported. They are packed in 200-lb fiber drums or 100-lb paper bags. Additional information about the Startex series can be obtained by writing Textile Dept, Morningstar-Paisley, Inc, 630 West 51st St, New York 19, NY.

Pliolite 176

Pliolite 176, a synthetic rubber latex with special qualities that are said to prescribe is use in textile backsizing operations, has been introduced by the Chemical division of The Goodyear Tire & Rubber Co.

Upholstery and carpet backings and sizings for mattress ticking are especially recommended areas of use for this butadiene-styrene latex, said J E Warner, manager of the company's Coatings Department.

It is a versatile material that can be compounded to meet a wide variety of conditions, Warner said, and it contains a nonstaining anti-oxidant system. It can be used with or without a cure, depending on the desired end-use properties, he said.

The new latex has outstanding heat and light aging properties and imparts soft hand in end use applications, Warner explained. It has excellent stability and forms tough, flexible, low-odor films that have practically no tackiness, he added.

•

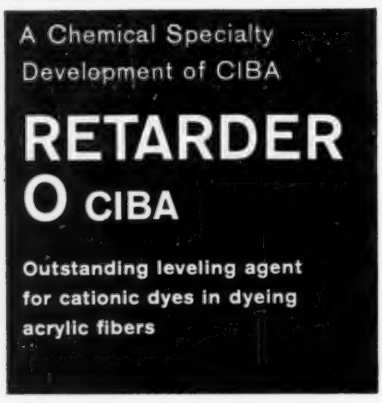
TAC Reduces Prices of Resin Copolymers, Buffers

Textile Adjuncts Corp, manufacturers of Poly-Couplers, has announced a significant price reduction in its complete line of resin copolymers and resin buffers for the United States, effective November 1.

The Poly-Coupler resin additives, which are available in three grades, regular, PCP and improved, are used as additives to thermosetting resins for protection against what is called "resin decay." The term is used to describe the gradual chemical reversal of cured resin systems, which are in theory odorless and water-insoluble. "Resin decay" is said to be caused usually by adverse temperature and humidity conditions, one or two months after goods are finished. Recent indications are that many resin systems generate severe formaldehyde-fume liberation even when stored under ideal conditions and within a few weeks of receipt of goods from the finisher. Many converters and garment manufacturers are presently complaining of formaldehyde fumes in early winter and spring, where this occurrence has usually been restricted to the summer months. Formaldehyde fumes frequently concentrate to irritating levels in converter, garment manufacturing and retail areas and require special chemicals, such as Eastonair odor-fume controllant, to remove its physiological effect from work areas.

Textile Adjuncts Corp has stated that this price reduction is made possible through increased consumption of the Poly-Couplers in the United States and abroad. With the advent of increasing finishing costs, attributed to increased costs of both chemicals and labor, the Poly-Coupler treatment of resin systems has allowed many smaller mills to compete price-wise in finishing costs with larger finishers, it is claimed. Under many circumstances, the use of Poly-Coupler reportedly has provided unwashed and unneutralized finished goods complete protection against excessive formaldehyde-fume liberation, and in the case of triazone-finished goods, protection against amine odors after an afterwash requiring about half the time as untreated goods.

The Poly-Coupler series of resin additives has been marketed for the past six years and is now distributed by Crown Chemical Corp, Providence, RI; Jersey State Chemical Co, Haledon, NJ; Osco Chemical Company, Inc, Atlanta, Ga; and Sidney Springer and Company, Inc, Los Angeles, Calif. Poly-Couplers are distributed abroad by Occo International, Inc, Jersey City, NJ and Gunze Trading Corp, Osaka, Japan.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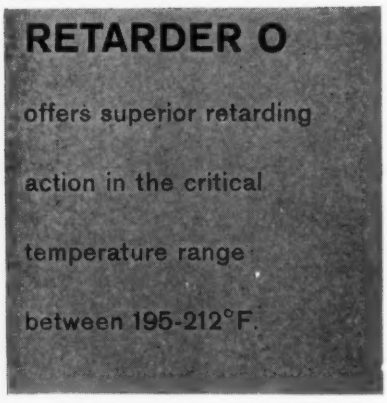
RETARDER O CIBA
Outstanding leveling agent for cationic dyes in dyeing acrylic fibers



RETARDER O insures a high degree of exhaustion in the critical temperature range of between 195-212°F. This cationic, aqueous solution can be added straight to the dyebath. RETARDER O is highly efficient and economical to use. Let us send you the technical folder describing RETARDER O in detail. CIBA Company Inc., Chemical Specialties Division, Fair Lawn, N. J.

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An important technical bulletin has been prepared on this subject, based on actual plant operations developed over a period of many years. It describes basic methods and procedures in detail and shows how significant advantages are now being realized in the preparation of oil-in-water and water-in-oil emulsions through the use of Morehouse Mills and Cowles Dissolvers.

In both types of operations these advantages include—Faster processing of larger batches with thorough distribution of components • Greater volume-per-hour than other equipment • Full control of quality and tints • Important savings in space, operating and maintenance costs • Greater versatility—ability to handle practically any type of material in practically any viscosity range—Dry Pigments, Pulp Colors, Soluble Resins, Dispersable Pastes and Emulsions • Ease of cleaning—rapid change-over without contamination.

Specific advantages in "water-in-oil" method—Rapid grinding of color pigments in resin solutions • Ability to handle all types of such bases • Fast, efficient dispersion of "cut clear" materials • Perfect dispersion in large batches.

Specific advantages in "oil-in-water" method—Complete in-plant preparation of printing color pastes from both dry pigments and color pulps • Perfectly level cuts with thickeners fully dissolved in minimum time • Brighter colors, reproduced to established standards from batch to batch, from month to month.

We are sure this bulletin will be interesting and helpful. Copy will be sent free upon request on your company letterhead for Bulletin 32-1960.

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Please send complete technical information, including results of comparative tests, concerning PROXOCREAM.

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• NAMES IN THE NEWS •

Payet

Columbia-Southern Chemical Corp has annouced that *George L Payet* has joined the firm as supervisor of textile research at its Barberton, O research laboratory.

Mr Payet formerly had been associated as a chemist with the J P Stevens and Co prior to joining Columbia Southern, a subsidiary of Pittsburgh Plate Glass Co.

•

Ernest J Wright has been appointed sales promotion assistant in the Textile Chemicals Department of American Cyanamid Co. He will be located at Cyanamid's advertising and promotion offices, 111 West 40th Street, New York City.

In his new position, Mr Wright will work with textile manufacturers, converters and mills, and major retailers.

Mr Wright joined Cyanamid in 1957 as a personnel interviewer in the company's New York headquarters. He was a salary analyst in the Personnel Division prior to his new assignment.

•

Turbo Machine Company, Lansdale, Pa, has announced the appointment of *William N Schwarze* as sales engineer.

Mr Schwarze has had broad experience in the textile industry. He came to Turbo from Lansdowne Steel and Iron Co, Morton, Pa.

Captein

Appointment of *H A Captein* as senior sales representative for the San Francisco field office of The Goodyear Tire & Rubber Company's Chemical division was announced Oct 18.

In this post, Captein will handle sales and service of the division's line of synthetic rubbers, vinyl resins and rubber chemicals for the Bay City area. The new West Coast office is in addition to those already maintained by the division in Los Angeles and Portland, Ore.

Prior to joining Goodyear in September, Captein acquired extensive experience as a research chemist with Crown-Zellerbach in Camas, Wash, where he had been employed since 1953.

•

The appointment of *E P Lavoie* as Southern textile service manager of Morningstar-Paisley Inc, has been announced. Mr Lavoie with headquarters in Charlotte, NC, will be available to mills throughout the Southeast for consultation on all M-P textile products, and will provide a liaison service between the mills and the M-P textile laboratories.

Previously, Mr Lavoie was associated with Wica Chemicals Inc in the Charlotte area. He has been active in AATCC affairs since 1936 and is currently secretary of the Piedmont Section.

Connor

Edward T Connor has been named vice president, marketing, of Instrument Development Laboratories, Inc, effective October 4.

Mr Connor was formerly employed by the General Electric Co for approximately 10 years, specializing in marketing and sales management before joining IDL's staff as manager, new product planning in September 1959.

•

Hartford Fibres Company has announced the appointment of *Walter H Schrader* as manager of product development for Zantrel Polynosic rayon fiber. He will be responsible for planning, coordinating and expediting the development of Zantrel fiber in a broad category of end-use areas covering woven, knit, industrial and nonwoven fabrics. Mr Schrader will report to *C Chester Bassett Jr*, vice president of Bigelow-Sanford, Inc for Hartford Fibres.

Hartford Fibres Company has recently completed installation of new equipment for the production of Zantrel and is now spinning this new cellulosic fiber at Rocky Hill, Conn.

Mr Schrader was formerly executive vice president and general manager of Stehli and Company. He will make his headquarters in the New York office of the Hartford Fibres Company, 140 Madison Avenue.

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The appointments of general managers of three newly organized divisions have been announced by General Aniline & Film Corp. *Harold G Shelton,* GAF vp, is the group executive in charge of the three divisions which are a part of the corporation's recently announced reorganization.

Named to the new positions are *C C Schulze* to head the Antara Chemicals Division, *Joseph W Conlon* the General Dyestuff Division, and *Robert J O'Brien* the Colloway Pigments Division.

The headquarters of the three newly organized divisions of the corporation, which formerly comprised the Dyestuff & Chemical Division, will be at 435 Hudson Street.

The divisions have manufacturing operations in Rensselaer, NY, Calvert City, Ky, Huntsville, Ala, and in Linden and Paterson, NJ.

All three of the newly appointed general managers held executive positions in the former Dyestuff & Chemical Division.

Dr Schulze was formerly assistant general manager of the Dyestuff & Chemical Division. Mr Conlon was its director of manufacturing and Mr O'Brien was in charge of its Pigments Department.

Dr Schulze joined General Aniline in 1942, and since, has held various executive positions covering all phases of the company's dyestuff and chemical research and manufacturing operations. He has been manager of the company's Rensselaer plant and manager of manufacturing for the division.

Mr Conlon, who became associated with the company in 1936, was also formerly plant manager at Rensselaer, where for some 20 years he held other executive positions in research and manufacturing.

Mr O'Brien, who has been associated with pigment manufacture and sales for 30 years, founded Colloway Colors, Inc, in 1932 and became its president.

Denis I Duveen (standing left), president of the Duveen Soap Co, Long Island City, NY, is shown receiving $500 check from Joseph B Evans, executive vice president of Dexter Chemical Corp, for his "noteworthy contributions to the advancement of the history of chemistry." A plaque, part of the fifth annual Dexter Award, was presented to Mr Duveen by Virgil Payne (far left), chairman of the Division of History of Chemistry which administers the Award. Second from left is Henry Guerlack, Cornell University, principal speaker at the divisional luncheon held recently in New York. Aaron Ihde, Univ of Wisconsin, is on far right.

Daileader

Berray

Robert L Daileader has been named sales representative for the Silicone Products Department of the General Electric Company. His office location will be 1285 Boston Avenue, Bridgeport, Conn.

He joined the General Electric Company in April 1959, serving as a technical service specialist in the rubber market section of the Silicone Products Department until his present assignment.

James S J Berray has been named sales representative for the Eastern District of GE's Silicone Products Department. His office location will be 5050 State Road, Drexel Hill, Pa.

Mr Berray joined the General Electric Company in April 1956. From December 1958 to the present he has been assigned to the Company's Flight Propulsion Laboratory at Evandale, Ohio.

Paul A Merriam, a sales engineer representing Riggs & Lombard, Inc, Lowell, Mass, in the Providence area, retired this summer after having been connected with the Lowell firm for twenty-five years.

Mr Merriam represented Riggs & Lombard in Rhode Island, Connecticut, and southern Massachusetts working out of his own office in Providence.

Before his affiliation with Riggs & Lombard, Mr Merriam was chief engineer for the U S Finishing Co.

•

JOHN POLITI, district technician in charge of textiles for the Kelco Co, died recently at the Muhlenberg Hospital, Plainfield, NJ, after a short illness.

Mr Politi was widely known and respected both as a man and for his ability in the textile printing industry. His entire adult life of 35 years was spent serving the industry.

Since joining the firm eight years ago Mr Politi had made his headquarters at the Kelco Co's main offices in Clark, NJ, handling sales and technical work for their Eastern division.

He is survived by his wife, Louise, two sons, Edward and Richard, his mother and one brother.

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Abstracts

(*concluded from page 83*)

samples of fabrics which have been given a crease-resistant finish with a view to determining the reagents with which they have been treated. When urea-formaldehyde and melamine-formaldehyde were the only aminoplasts used for the crease-resisting process, it was possible to take short cuts in their identification. Today, however, the growing range of products for this finish necessitates more extensive analysis.

There are more than 150 trade products on the market, but many of these are the same chemical compounds which, generally speaking, are perhaps no more than six in number. It is these compounds only which are considered in these test methods.

As all the conventional crease-resisting processes make use of amino-aldehyde condensation products, a test for formaldehyde is generally the first approach to analysis; however, formaldehyde may be present in one or more of three ways: free formaldehyde from uncondensed reagents; formaldehyde in the amino-aldehyde product; formaldehyde which has combined with cellulose. Hence the positive test for the presence of formaldehyde does not necessarily indicate the presence of an amino-aldehyde product.

The author discusses five different tests for formaldehyde: Schryver's, Schiff's, Carbazole, Dimedone and Chromotropic Acid.

A qualitative test procedure is given for Urea, Melamine, Ethylene Urea and Triazones.

A spot test for amino-aldehyde products is based on acid hydrolysis and reaction with phenylhydrazine and ferric chloride.

Useful qualitative results can often be obtained by the use of paper chromotography. Several methods are described.

Regarding quantitative tests, the most satisfactory test for the amount of resin in the treated fabric is based on the removal of the amino-aldehyde by acid hydrolysis. However, additions made to the amino-aldehyde product (eg, softeners, thermoplastic polymers and silicones) will complicate the results; also, the so-called reactant resins (eg, cyclic ethylene urea) are not east to remove completely even by acid hydrolysis. Several methods for the removal of urea- and melamine-formaldehyde are described.

The presence of free formaldehyde in the treated fabric is generally undesirable, and it may be necessary to apply a quantitative test; a colorimetric version of Schiff's test is recommended.

It is sometimes necessary to determine the formaldehyde which forms part of the amino-formaldehyde in the treated fabric. Several methods of analysis for this purpose are described.

Because of the various amino-aldehyde products used in resin-finishing, alone and in admixture, the quantitative estimation of the amino-constituent is not easy; most trade products are impure, and the triazones, for example, often contain some urea-formaldehyde. Where many analyses are required, the author recommends a nitrogen determination with the Kjeldahl apparatus.

Quantitative tests for urea and melamine are also described.

•

Polypropylenes: Their Structure and Properties

Finch, C A, *Fibres & Plastics 21*, 14-16, Jan, 1960

The author explains the stereochemistry of polyethylene (the simplest vinyl polymer, consisting simply of a chain of methylene groups) and the substituted polymers, eg, polypropylenes, in which hydrogen atoms are replaced by methyl groups.

Polypropylenes exist in two forms, "isotactic" and "atactic", depending on the steric arrangement of the methyl side-groups. The isotactic polymer is made from propylene, a by-product of the petroleum industry, and due to the low price of propylene is potentially a very cheap polymer.

Polypropylene as a fiber is very similar to polyethylene in its properties, but has several important advantages, eg, a much higher melting point and a higher tensile strength. It is unaffected by water. This property is of course not entirely favorable when applied in the fiber field; most of the uses for polyethylene fibers lie in industrial applications, apart from protective clothing. However, polypropylene staple has been suggested for use as an apparel fiber; it has only a slight "waxy" hand, and could perhaps be employed as a diluent for wool, eg, in heavy tweeds.

Polypropylene has high chemical resistance, which makes dyeing a major problem. The most satisfactory method, from the point of view of colorfastness, is the so-called "spun-dyed" technique, where the polymer is pigmented in the melt before being extruded through the spinnerettes.

Another method of dyeing, less satisfactory but of wider application, makes use of the fact that polypropylene is subject to surface photo-oxidation. By controlled oxidation, a number of chemically reactive groups (probably hydroperoxides) can be established on the surface of the fiber, and may serve as dyeing sites. By suitable application of reactive dyes a reasonably fast color may be applied to the fiber. This method of dyeing, however, is still very new.

The author states that "the whole field of stereoregulated polymers is in a state of intensive development."

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